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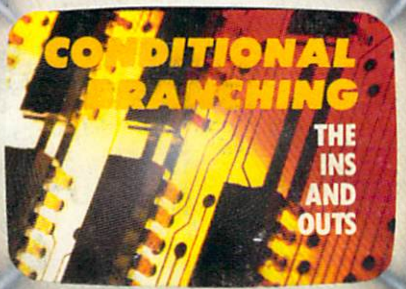
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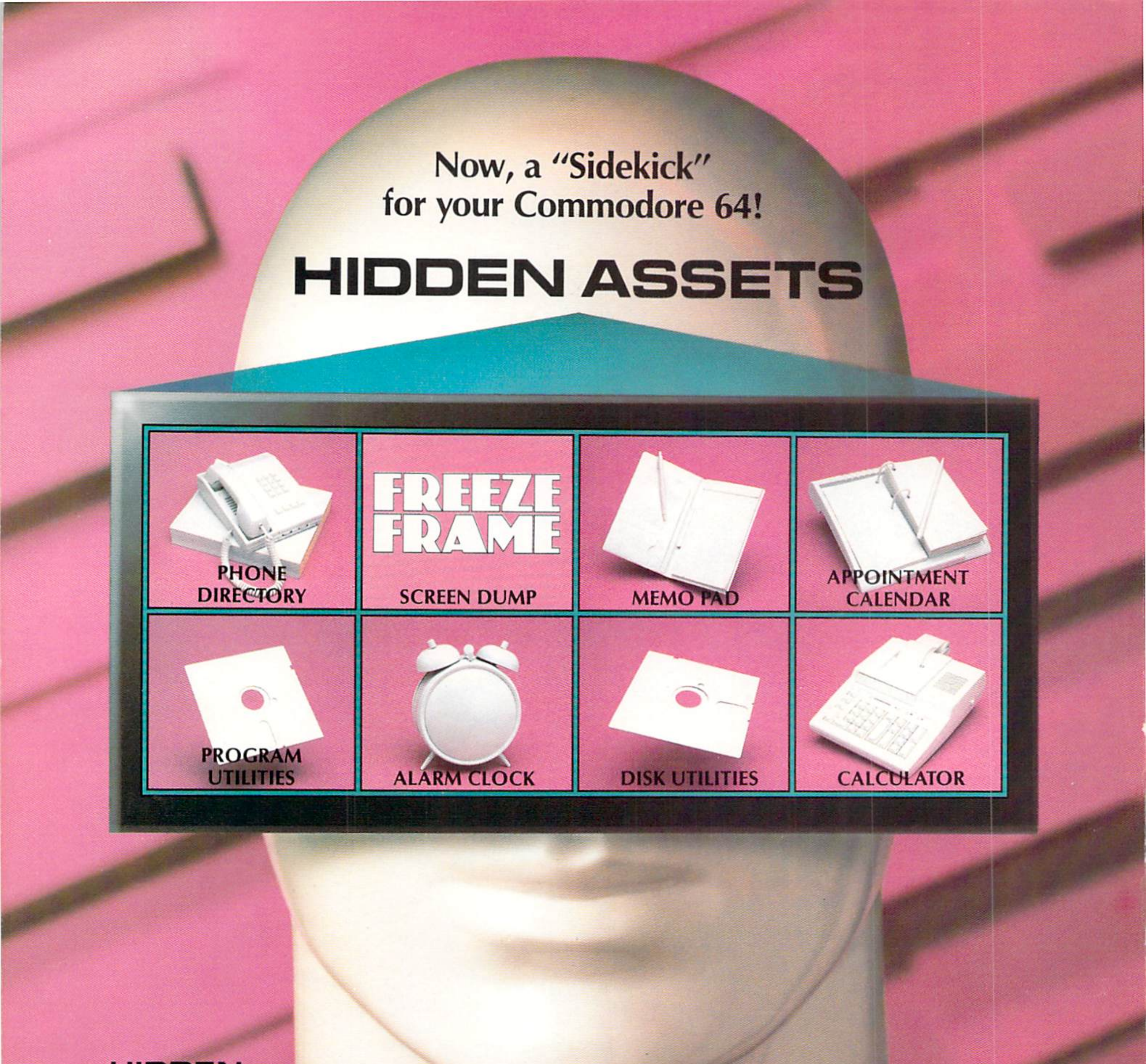
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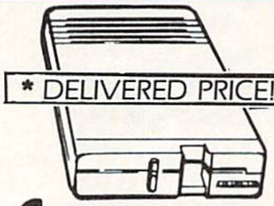
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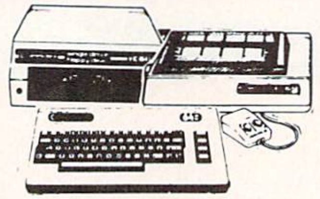


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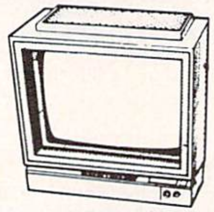
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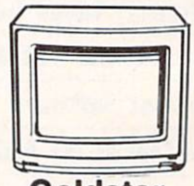
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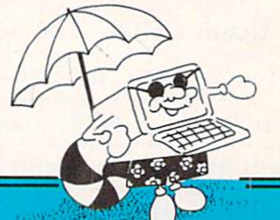


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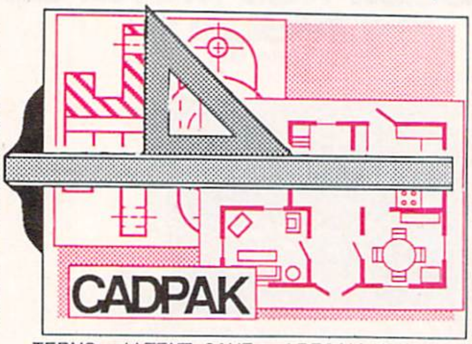
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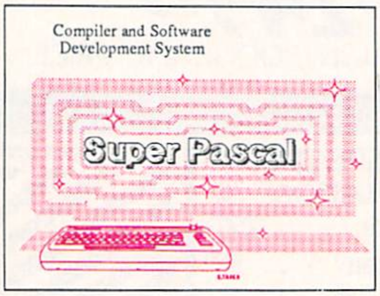
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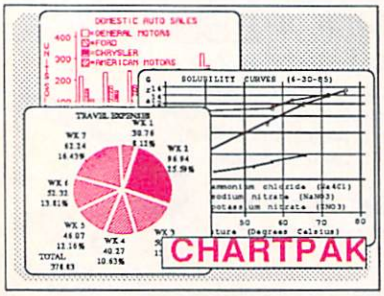
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VIEW FROM THE BRIDGE

Morton Kevelson's not fooling us. He delayed handing in his review of Commodore's Amiga computer until this month under the premise of wanting to do the most thorough job possible. We know the truth, though: he loved the machine so much that he wanted to keep our loaner in his possession for as long as he could.

But with the publication this month of his analysis of this incredible computer, the jig is up for Morton...and the wonderment is just beginning for you! If you have $1295 in the bank that you want to stay there, pass this article by. If you prefer to bloody your bankbook on the cutting edge of technology...turn to page 53!

Dropping down one Commodore echelon, the July *Ahoy!* also features the latest on the C-64 and C-128:

• Dale Rupert leads you around in *Loops Galore!* as he investigates the range of program flow control statements in BASIC 2.0 and 7.0. The included programs demonstrate the insertion sort algorithm. (Turn to page 20.)

• Our *Commodore Roots* assembly language column launches into a series of all-128 installments with *Mapping the C-128.* Mark Andrews' groundbreaking 128 work will appear later this year in a book by Howard W. Sams & Co.—but you'll read it here first! (Turn to page 25.)

• Not to leave beginners out of the 128 revolution, Cheryl Peterson's *Cadet's Column* on the 64 and 128 disk operating systems includes original, functional DOS programs for each computer.

• Computer games, like movies, must be popular to warrant sequels. Such is certainly the case with Walter E. Meyers' *Fidgits* (Aug. '85). That well-received typing/alphabet tutor has been succeeded by this issue's *Fidgits' Music School,* wherein the same avian educators teach children the sounds, names, and positions of musical notes. (Turn to page 34.)

• James C. Hilty may someday write sequels to a few of the many games he's published in *Ahoy!*, but right now he's too busy coming up with terrific new ideas—like this issue's *Escape from Skull Castle.* (Turn to page 36.)

• For certain applications, knowing the number of words in a manuscript is essential. *Wordcount* makes this possible for C-128 and C-64 users. (Turn to page 30.)

• Are you sportsmanlike enough to enjoy waiting an hour and a half for your turn at a computer game while your buddy racks up several billion points...or would you rather blow the sucker off the screen? *Head-On*, permitting simultaneous two-player action, should please folks who opt for the latter. (Turn to page 68.)

• The latest micro-masterpiece by Buck Childress, *Screen Sleuth* allows graphics programmers to instantly know valuable information about any character on the screen, including custom characters. (Turn to page 39.)

• This month's *Entertainment Software Section* takes a highbrow turn with a survey of *Chess Programs for the Commodore 64,* plus full-length reviews of *Leader Board, Party Songs, Battle Group, The Graphics Magician Junior, The Crimson Crown,* and *Nine Princes in Amber.* (Turn to page 49.)

• Programmed for the C-128 in 128 mode, *Nebergall Run* pits you against the forces of the Black Nebula. (Turn to page 68.)

• *Reversed Remarks* allows programmers to highlight REM statements, saving space and memory. (Turn to page 72.)

You'll find a great deal more inside, including an *Art Gallery* devoted entirely to Amiga graphics; *Commodares,* the monthly outlet for Dale Rupert's sadistic streak; *Reviews* of the Canon PJ-1080A Color Inkjet Printer and the *Home Information Management System;* and other items of interest.

This month's *Ahoy!* program disk, like last month's, is packed to the inner hub with COMAL programs provided by the COMAL Users Group, plus the operating system needed to run them. See page 31 for information on ordering the *Ahoy!* disk.

Us, we're about to play with our new Amiga. If we could just get Morton to put it back *together...*

—David Allikas

SCUTTLEBUTT

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NEW COMMODORE 64

Though Commodore would like to tear all mention of them out of the history books, *you* remember the Plus/4 and C-16—and your confusion at the time of their announcement. Why, you asked, would Commodore bill a machine like the Plus/4 as the new generation of home computer, when it was inferior to the C-64 in significant ways—*and* more expensive? Or position it as a business machine, when the productivity software supplied on ROM would be inadequate for a Good Humor man? And the more puzzling question—why release the C-16?

Then Commodore came out with the excellent C-128, and everyone forgave them. But the company appears to be poised for another confusing leap.

To be announced sometime prior to June's Consumer Electronics Show, the C-64C will be a Commodore 64 in a new case that will resemble a C-128—same low profile, same color. Included will be Berkeley Softworks' disk-based *GEOS* operating system, which creates a Macintosh-style user interface (see April *Scuttlebutt*, page 14), and Quantum-Link BBS software, which has built-in word processing and graphics programs. The price will be under $200.

If you're as tight with your dollars as we are with ours, the first question you'll ask is the same one we did of Commodore's PR representative: who's going to want this thing when a C-128 can be had for another $50? His answer was that the 64C will be aimed at the first time computer buyer, especially teenagers and younger, while the C-128 will be marketed as a computer for users of high school age and above.

Which obviously made a great deal of sense to someone at Commodore. That someone, however, does not have to pay for his C-64C. We feel that the people who do will recognize the 128 as the better investment. How far under $200 the C-64C will retail makes a great deal of difference. But by the time the new computer sees release, the C-128 is liable to have dipped below the $200 mark itself.

Commodore may be depending heavily upon the appeal of *GEOS.* While it has lots, the pre-high school age user is the least likely to be enthralled by a Macintoshlike operating system. The middle-aged computerphobic, yes. But we all know how afraid of computers our little cousins and nephews and daughters are.

Still, Commodore's representative centuated the positive: that the C-64C will be the first under-$200 computer with a graphic-style user interface. He sees it as a product that will "add new life to the family computer market." We sorely hope so. We can use the new readers.

(See page 53 of this issue for details on another new marketing move by Commodore—the $500 reduction of the list price of the Amiga 1000.)

Commodore Business Machines, Inc., 215-431-9100 (see address list, page 106).



Thomas Rattigan, new Commodore CEO in the wake of Marshall Smith's departure.

SMITH MARSHALED OUT

As you know by now if you read the financial pages, Thomas Rattigan succeeded Marshall Smith as Commodore's president and CEO on April 1. According to chairman of the board Irving Gould, the move "completes the executive transition plan that has been in place since Mr. Rattigan joined the company (in April 1985)." Whether the decision to replace Smith was actually made back then, or more gradually as quarter after quarter ended with hundred million dollar losses, we can't know for certain. But either way, Commodore is to be commended for its initiative in correcting the flaw in top management that analysts have identified as a significant source of their problems.

Commodore International, 215-431-9100 (see address list, page 106).

HIDDEN ASSETS

When we preannounced it in March's *Scuttlebutt* with the sketchy details then available, Cardco's "transparent" utility cartridge modeled after Borland's popular *Sidekick* program for the IBM PC had not yet been named. Since christened *Hidden Assets,* the $79.95 program offers the C-64 user eight similar utilities that can be instantly called up in the middle of whatever program is operating on the computer. Because they reside on cartridge, the utilities do not occupy any of the C-64's internal memory.

Featured are a calculator (full math functions including logarithms, square roots, sines, cosines, etc.), memo pad (mini-word processor with word wrap, justification, and formatting commands), appointments calendar (full personal scheduling capability and freeform "to do" list), telephone directory (mini-database with sorting capability on any field), alarm clock (alerts user to any event via a beeper and a blinking screen border), programmer's utilities (ML monitor, mini editor/assembler, hex/decimal/ASCII conversion tables, and seven others), and disk utilities (six features including full implementation of DOS commands, formatting, renaming, and initializing). A C-128 version is planned for release in the near future.

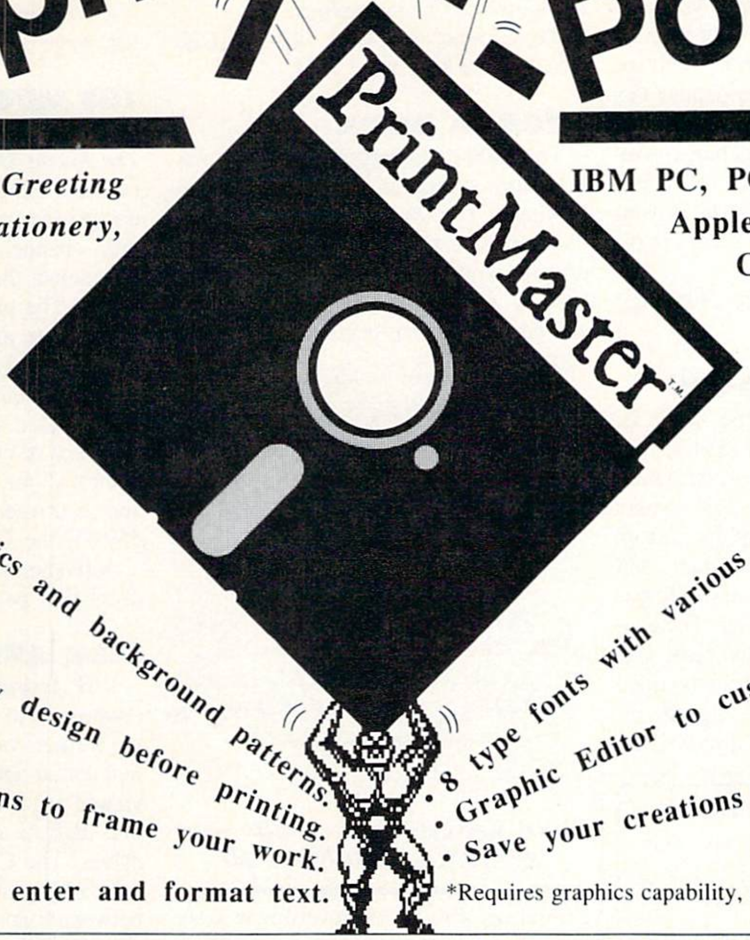
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Printers supported on the Apple version:
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Printers supported on the Commodore version:
C.Itoh Prowriter 8510 and Prowriter Jr.; Commodore VIC-1525 and MPS-801; EPSON FX, RX, and MX with Graftrax; Okidata 92, 93, 192, and Okimate 10; Star Gemini 10 and 15.

Printers supported on the Atari version:
C.Itoh Prowriter 8510; EPSON FX, RX, LQ-1500, and MX with Graftrax; IBM Graphics Printer; Okidata 82A/83A with Okigraph 1, 84 (Step II), 92 and 93; Star Gemini 10 and 15; Toshiba 1340, 1350, 1351, and P351.

Printers supported on the CP/M version:
C.Itoh Prowriter 8510 and Prowriter Jr.; EPSON FX, RX, LQ-1500, and MX with Graftrax; IBM Graphics Printer; Okidata 82/83A with Okigraph 1, 92 and 93; Star Gemini 10 and 15; Tandy DMP 105, 130, 430, 2100, 2100P, and 2200; Toshiba 1340, 1350, 1351, and P351.



• Most of the above graphics from PrintMaster and Art Gallery I.

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Reader Service No. 127

The 64 offer, made exclusively through *Ahoy!* in April's *Scuttlebutt:* their *IMCT* (morse code trainer), *ESP Tester, One-Shot* (word processor), and *Notebook Fun* programs all for $4.95. But because at these prices they literally will go broke, they've asked us to announce that the offer will terminate July 31, 1986. Additionally, a $3.00 shipping charge is required (PA residents add 6% sales tax). Remember that you must state in your order that you are an *Ahoy!* reader in order to qualify.

AC3L Software (see address list, page 106).

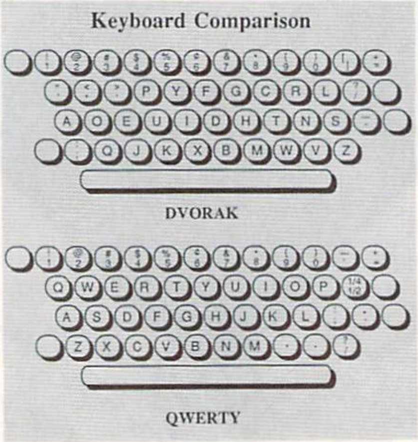
PRINT SHOP ADD-ON

Previously released for the Apple II, *The Print Shop Companion* ($34.95) expands the capabilities of Broderbund's popular program, allowing C-64 owners to create weekly and monthly custom calendars, personalized borders and fonts, tile patterns, and fantastic "creatures" with the creature maker. The program also lets users edit and create new *Print Shop* graphics. Images can be filled in with patterns, mirrored, moved, inverted, or flipped automatically. Text can be added to graphics, and lines, boxes, and ovals can be drawn instantly. Included are 50 original border designs, 12 new fonts, and 20 new graphics.

Broderbund Software, 415-479-1700 (see address list, page 106).

DVORAK BOOK

The grass roots support for the Dvorak keyboard configuration (see illustration) continues. *The Dvorak Keyboard* answers common questions that typists, school officials, and managers have asked about Dvorak. According to the author, the federal government has begun conversion to Dvorak as a result of government tests revealing that Dvorak typists are up to 74% more productive than Qwerty. Price of the book is $12.95 plus $1.00 to ship any number of copies.



Dvorak Keyboard ***points out differences.***
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Freelance Communications, 707-826-0102 (see address list, page 106).

VOICE MASTER ENHANCED

A speech editor that has been added to the driver software provided with the Covox Voice Master (see *Speech Synthesizers for the Commodore Computers,* December '85 *Ahoy!*) will allow the user to edit and modify the amplitude portions of stored speech templates to refine the quality of digitized speech during playback. The editor permits tailoring the amplitude of portions of words, especially the plosive articulations, in order to improve quality and intelligibility.

The editing routines are used after the voice templates have been digitized and stored. The user selects a template, modifies the amplitude to achieve the desired tonal characteristics, and stores the modified version in place of the original. The video display shows the voice wave before, during, and after modification.

Current Voice Master owners can upgrade the software by contacting Covox directly.

Covox, Inc., 503-342-1271 (see address list, page 106).

THE MUSIC STUDIO

An enhanced version of Activision's *The Music Studio* provides both beginners and experts with the tools to create compositions ranging from simple tunes to 15-channel, 3-verse scores that can be channeled through an electronic keyboard. The program provides the ability to create musical instruments, sound effects, and lyrics that can be modified and edited into complete musical passages. Included are creativity aids such as a library of compositions and a "music paintbox" for experimenting with notes and instruments. The Amiga version is $59.95, the C-64 version $34.95.

Activision, Inc., 415-960-0410 (see address list, page 106).

DISK ASSISTANT

Disk Assistant ($11.95) reduces 15 disk commands to a single keystroke, including format, validate, erase, and rename. Sequential data files on any disk can be viewed or printed, as well as copied from one disk to another on single or dual drives. The C-64 user can also view or print a Help file, toggle the primary drive between 8 and 9, and display or print a disk directory.

Spectrum 1 Network, 213-897-2060 (see address list, page 106).

EPROM HANDBOOK

If Morton Kevelson's opus in the July '86 *Ahoy!* only left you lusting for more information of Eraseable/ Programmable Read Only Memory cartridges, the *EPROM Programmer's Handbook* ($32.95) covers a variety of topics with the average user in mind. Included are explanations of how EPROMs work, programming them using the Promenade or other EPROM programmer, types of cartridges, and how to modify the 1541 DOS or C-64 Kernal. The included disk provides several programs, including *Menu Maker* (put up to 10 programs on one cartridge) and *Freeze Cartridge* (preserve all memory below BASIC including screen & zero page on RESET or RESTORE).

CSM Software, Inc., 219-663-4335 (see address list, page 106).

TURNKEY HELP

Here at *Ahoy!*, we just keep laying on the user support. Thousands have dialed

up our bulletin board (718-383-8909) and programming hotline (212-239-0855) for help with punching in programs, to ask questions about articles, etc. And now Don Lewis has prepared a detailed addendum to *Turnkey 64* (February '86 *Ahoy!*), answering the most frequently asked questions about his do- it-yourself AUTOEXEC cartridge project. A free copy can be obtained by sending a stamped and self-addressed envelope to Don at P.O. Box 521, Folsom, PA 19033.

AMIGA TEMPLETS

A pair of templets that fit over the Amiga keyboard are available from Slipped Disk Inc. for $9.95 each ($16.95 for both). *Amiga BASIC Notes* covers SUB programs, BASIC I/O and non-I/O statements, menu and string gadget shortcuts, mouse functions, and more. *Amiga DOS Notes* includes file and disk management, directory, informational, CLI control, and batch file commands, logical devices and device names, pattern matching, command line editing, and I/O redirection.

Slipped Disk Inc., 313-583-9803 (see address list, page 106).

THE THREE NYMS

Homonyms, Antonyms, and Synonyms supplies the teacher with drills in each concept, a program management system allowing him or her to determine the number of questions presented and turn the arcade-style "reward" game on or off, and a student management system for recording lesson numbers, raw scores, and percentage scores for up to 200 students.

Gamco Industries, Inc., 1-800-351-1404; in TX call collect 915-267-6327 (see address list, page 106).

BIG BLACK BOOK

The Black Book of C-128, a 260-page dictionary of facts on the computer in all three of its operating modes and use of the 1571 and 1541 drives, is designed to assist programmers of all levels. Each chapters has its own detailed table of contents, and more than 75 charts and tables are included. Space is provided in the back of the book to record equipment purchases, where to find supplies, BBS numbers, and more. Price is $15.95 plus $2.00 postage.

Value-Soft Inc., 503-246-0924 (see address list, page 106).

TELECOM NEWS

The Independent Commodore User Group (ICUG), left an orphan by the closing of Viewtron (see last issue), has found a home on PlayNET. By the time you read this, special interest groups and BBS areas should be active and operating almost exactly as before. (PlayNET also seems to be operating exactly as before, despite filing for Chapter 11 bankruptcy protection in March.)

ICUG may soon be available on The Source as well. And whether ICUG appears there or not, The Source is courting former Viewtron users by waiving the $49.95 registration fee and $10 a month usage fee for the first year, along with providing a free manual and $50 credit toward online time, for former Viewtron users only.

The Source, 800-336-3366 (see address list, page 106).

GAME NEWS

The Kobayashi Alternative Procedures Manual is a welcome addition to Simon & Schuster's *Star Trek: The Kobayashi Alternative,* which most of *Ahoy!'s* editors found virtually unplayable. The manual provides rules of communication and survival on the Enterprise and on the Trianguli planets, including necessary instruction in operating portable equipment, beaming down to planets, and using the planet coordinates to move about. A sealed portion of the manual may be opened to reveal Clues for Solving Dilemmas on Trianguli Planets. The manual will be sent free of charge to warranty holders.

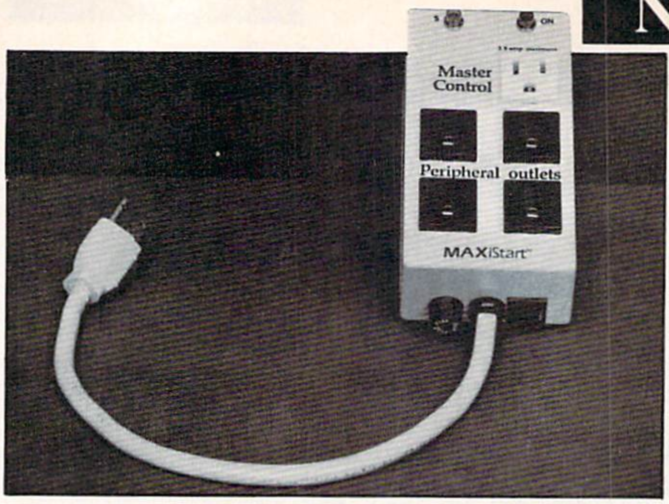
Simon & Schuster Electronic Publishing Division, 212-333-3397 (see address list, page 106).

IntelliCreations has formed an Adventurers' Club for users of its role-playing/fantasy game, *Alternate Reality–The City.* All individuals returning their warranty cards to the company will receive a free bimonthly newsletter containing playing hints suggested by users and answering questions regarding gameplay, mapping, weapons, and more. The first issue consists of four 8½ X 11" pages.

IntelliCreations, Inc., 818-886-5922 (see address list, page 106).

Electronic Arts' time-tested tunneling contest, *BoulderDash,* and its *BoulderDash II* sequel have been packaged together as *Super BoulderDash.* Price of the pair for the C-64 is $22.95.

Also from EA comes *Lords of Conquest* ($32.95), a C-64 strategy game similar to the RISK board game. The action takes place on a world map, 20 different types of which are built in, including maps of various continents, historical maps like the Roman Empire, and



The MaxiStart surge/spike suppressor and noise filter protects electronic equipment from transient and line noise and improves circuit component reliability. READER SERVICE NO. 146

computer-generated random maps. Players choose their home territories at the beginning of the game, then try to protect their holdings while conquering opponents' territories. Resources like horses, iron, timber, and coal, which can be used to buy additional forces at the beginning of each turn, are randomly distributed throughout the territories, causing the action to focus on those territories. In multiplayer games it is possible to make treaties and alliances and trade resources.

Electronic Arts, 415-571-7171 (see address list, page 106).

Las Vegas Poker Machine ($29.95) simulates the popular video poker casino game in which the object is to attain a winning hand from an initial five card deal and one round of discards. A statistical analysis mode lets the player determine the best discard method for any hand. The payoff chart may be adjusted to match any casino playoff system.

Gerhardt Software (see address list, page 106).

Gerry the Germ, one half of the latest release in Firebird's Super Silver Disk Series (two games on one disk for $19.95), conducts the player through the human body as the title character tries to prove his worth as a virus. The second offering, *Microcosm,* puts the player aboard a crippled interstellar freighter with the job of defending a priceless agricultural cargo against a horde of mutant insects.

Firebird, 201-934-7373 (see address list, page 106).

Neutral Corners allows C-64 owners to box against a human opponent, against the computer, or in Invisible Mode (pugilists show up when they throw punches or are hit by a punch). The object is to outscore your opponent while watching the onscreen gauges for ratings on breath, blood level, and head, arm, and leg fatigue. Future releases will include wrestling and karate games.

KAB Software (see address list, page 106).

SURGE SUPPRESSOR

The latest in the Panamax line of voltage surge suppressors, the MaxiStart surge/spike suppressor and noise filter provides five outlets, one of which is a master control receptacle. One component (usually the CPU) is plugged into this receptacle, enabling the user to power up or down the entire system by turning the master component on or off.

Panamax, 1-800-472-5555; in CA 1-800-472-6262 (see address list, page 106).

DISK INDEXING

Disk-Dexer ($24.95) will read the names of the files stored on a disk and print them on a 3½ X 15/16" or 4 X 1-7/16" label (120 small and 80 large labels are included). Each label shows the disk name and ID, number of files, number of unused blocks, and up to 40 filenames. Continuation labels for long lists and multiple sets can be printed. Filenames can be listed in the order they appear on the disk or alphabetically. The C-64 user may also select the filenames to appear.

Enhance Development Company, 1-800-231-4545 or 314-423-8525 (see address list, page 106).

AMIGA PROGRAMS

Three productivity packages for the Amiga from Batteries Included, planned for release later this year:

The *BTS* spreadsheet ($69.95) provides a maximum worksheet size of 1000 rows X 1000 columns. Provided for are key math, stats, and financial functions, from addition to net present value, plus logical operators AND, TRUE, FALSE.

PaperClip Elite ($129.95) includes all the features of the C-64 and C-128 versions, plus such features as a real-time spelling checker, idea processing, independent linked windows, and integrated text and graphics.

Degas Elite ($79.95), a conversion of BI's excellent Atari 520ST release, is a professional graphics program for creating business graphics, posters, newsletters, and original art. Control over colors, multiple text fonts, and fill and brush patterns is provided. Automatic drawing functions include K-line, Circle, Box, and Frame; among the graphic features are Shadow, Magnify, Flip, Scale, and Rotate. It is also possible to cut and paste between pictures on multiple work screens, or export pictures to *Paper Clip Elite.*

Batteries Included, 416-881-9816 (see address list, page 106).

PRESCHOOL ROBOTICS

The Adventures of Dobot ($59.95) provides preschoolers to first graders with practice in problem solving and critical thinking, along with basic keyboard training, as they use four direction keys on the C-64 to control the movements of

Reader Service No. 130

a robot. Seven different activities require students to plan, match, sort, classify, order, and sequence to find solutions. Each activity is introduced by a demonstration that shows the child what to do and how to do it, so no reading is necessary. A management system allows the teacher or parent to tailor the program to each child's capabilities.

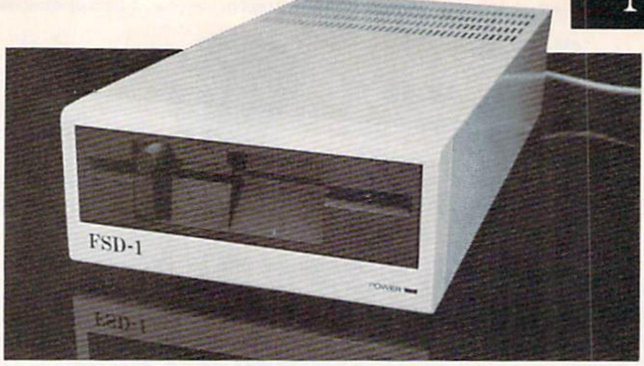
Educational Activities, Inc., 516-223-4666 (see address list, page 106).

SONG WITHOUT END

Still another release in the *Mastery in Music* series, *Singing Master* ($49.95) for the C-64 provides exercises for developing pitch and interval awareness. Included are scales, thirds, and intervals in every major key, plus complete chord analysis.

MasterSoft, 503-388-7654 (see address list, page 106).

IMPROVED DRIVE



FSD-1 disk drive has a metal outer casing designed to reduce radio wave interference and less heat resistance. READER SERVICE NO. 148

The new FSD-1 disk drive, while internally similar to the 1541, features a metal outer casing designed to reduce radio wave interference. The device number can be changed by externally located DIP switches. An improved power supply has cut down heat resistance as compared to the 1541. In addition, the drive is supposedly quieter and less prone to head-banging. The manufacturer further claims 100% compatibility with all commercial software.

Emerald Component International, 503-683-1154 or 1-800-356-5178 (see address list, page 106).

SAMS BOOKS

Three new publications from Howard W. Sams:

The 576-page fourth edition of the *Computer Dictionary* ($24.95) defines basic computer terms and serves as a handbook of computer related topics. Included are more than 12,000 terms, and explanations of micro, mini, and mainframe technology, including new entries on such subjects as robotics and artificial intelligence.



Utilizing CAD in electronic design. READER SERVICE NO. 150

Data Communications, Networks, and Systems ($39.95) covers the state of said art, including the advantages and disadvantages of local area networks, how modems, multiplexers, and concentrators work, the characteristics of fiber optics and coaxial cables, and the forces shaping the structure and regulation of common carrier operations.

Continuing where last issue's survey of CAD packages for the C-64 left off, *Computer-Aided Logic Design* ($25.95) provides a background in the use of computers in developing and verifying the operation of electronic designs. Devices like burglar alarms and traffic light controllers are used as practical examples to combine theory and techniques of electronic design with the application of CAD tools. Included are BASIC listings for Logic Simulation and Logic Minimization programs designed to run on almost any personal computer.

Howard W. Sams & Co., 317-298-5400 (see address list, page 106).

MIDI DATA STORAGE

Three new MIDI data storage programs for the C-64 are available from Music Service Software:

The *CZ Dumpstor* patch librarian ($54.95) for the Casio CZ101, CZ1000, CZ3000, and CZ5000 synthesizers allows three banks of sixteen patches to reside in memory at one time. The program includes 128 professional patches.

The *Data Dumpstor* ($59.95) stores patches, sequences, drum patterns, and other MIDI information from over 20 different instruments. Data is accepted from the DX-7, RX- 11, TX-7, DX-9, QX-7, and DX-100, and several more Yamaha instruments, as well as instruments by Korg, Sequential, Oberheim, and others. The program holds 36K, and MIDI information from several instruments can be stored or sent at the same time.

The *TR-707 Dumpstor* ($39.95) accepts drum patterns and songs from the Roland TR-707 and TR727 drum machines, eliminating the need for cassette storage.

All three programs utilize a fast MIDI file loading routine enabling a 4K file to load in 4 seconds, a 14K file in 9 seconds.

Music Service Software (see address list, page 106).

PRINT SHOP GRAPHICS

Four disks of additional graphics for *The Print Shop*, different from those on

Continued on page 106

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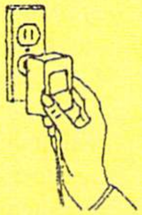
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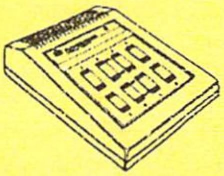
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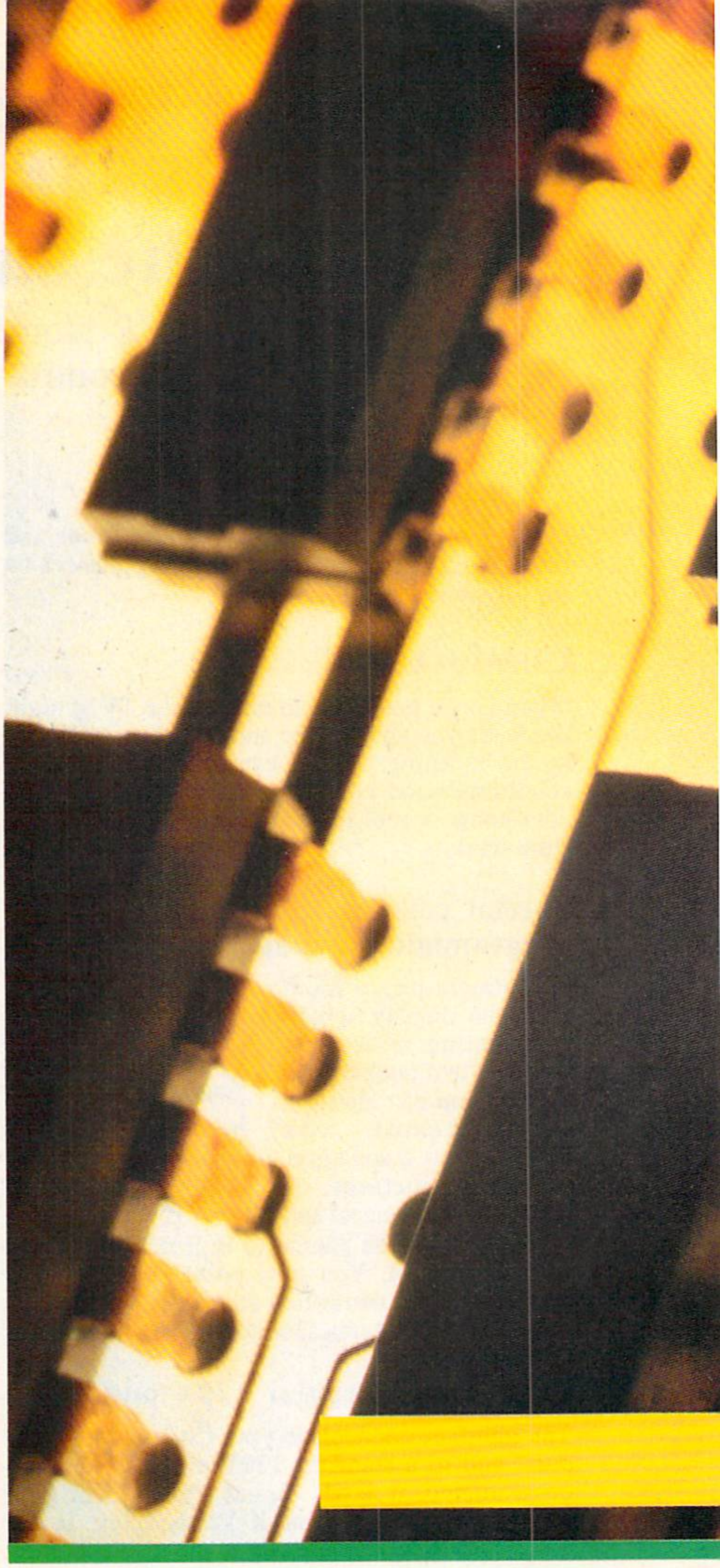
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The sequence of the operations performed by a computer program is called the program flow. Every example of program flow can be implemented using only IF/THEN statements. The IF/THEN construct represents the simplest form of conditional branching. In many cases it would be very cumbersome to use only IF/THEN statements. For that reason, high level languages such as BASIC, Pascal, and COMAL provide numerous other "control statements" to simplify programming and readability of programs.

One of the primary distinctions between "unstructured" or "weakly structured" languages such as BASIC or FORTRAN and the "structured" languages such as Pascal, COMAL, ADA, and MODULA-2 is the number of advanced program-flow structures available. (The other primary distinction is the number of high-level data structures available.)

On the VIC 20 and the C-64, the program control statements consist of these: GOTO, GOSUB, ON/GOTO, ON/GOSUB, IF/THEN, and FOR/NEXT. Again, there is no example of program flow which cannot be implemented with some combination of these statements. In many cases, however, the implementation may be difficult and convoluted.

TAKE THIS BRANCH

Look at this simple example. "If the magnetic field increases, then we must use quasi-ion shields, otherwise the super-permeable shields will suffice." A natural program implementation of this algorithm would be:

```
10 IF (MAGFLD) > (OLDMAGFLD) THEN (SHIEL
D) = (QUASIION) : GOTO 30
20 (SHIELD) = (SUPERPERM)
30 ...CONTINUE...
```

This sequence is cumbersome because of the GOTO 30 to branch around line 20. (Of course the GOTO is executed only if the condition following the IF statement is true.) One way to eliminate the GOTO statement is to rewrite the program as such:

```
10 (SHIELD) = (SUPERPERM)
20 IF (MAGFLD) > (OLDMAGFLD) THEN (SHIEL
D) = (QUASIION)
30 ...CONTINUE...
```

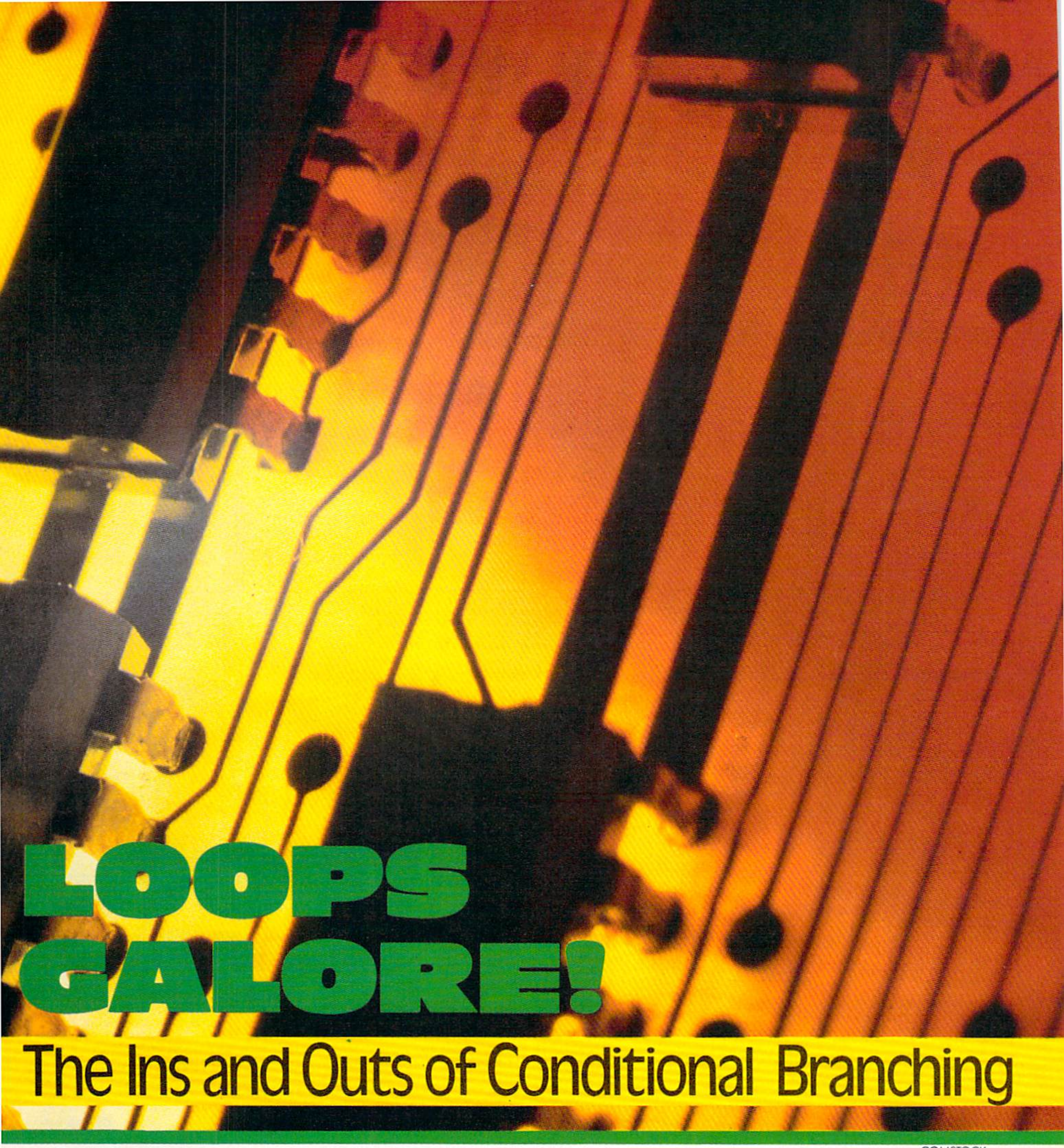
This looks like a "cleaner" implementation although it is clearly a convoluted representation of the original algorithm.

BY DALE RUPERT

OR ELSE!

One of the most useful features included in BASIC 7.0 on the C-128 is the ELSE statement. When the outcome of a decision leads to one action or another, the IF/THEN/ELSE construct provides a natural implementation as shown here:

```
10 IF (MAGFLD) > (OLDMAGFLD) THEN (SHIEL
D)=(QUASIION):ELSE (SHIELD)=(SUPERPERM)
20 ...CONTINUE...
```



LOOPS GALORE!

The Ins and Outs of Conditional Branching

COMSTOCK

The statement(s) following the ELSE are executed only if the condition following the IF is *not* true. Statements between the THEN and ELSE statements are executed only when the IF condition *is* true.

If each of the conditional branches above consisted of much more than a single "LET (SHIELD) = " statement, the program would get into more complications. For example, "If the particle-size is greater than three microns, then put up two-micron shields, fire retros and display the message 'Major meteoritic activity is expected', otherwise remove shields, increase speed by ten percent, and display 'Operation Phase 2 commenced'.

Clearly if the number of statements in either conditional branch will not fit into a single program line, we would probably create a separate subroutine for one or both branches:

```
10 IF (PARTSIZE) > 3 THEN GOSUB 500 : GO
TO 50
20 ...REMOVE SHIELDS...
```

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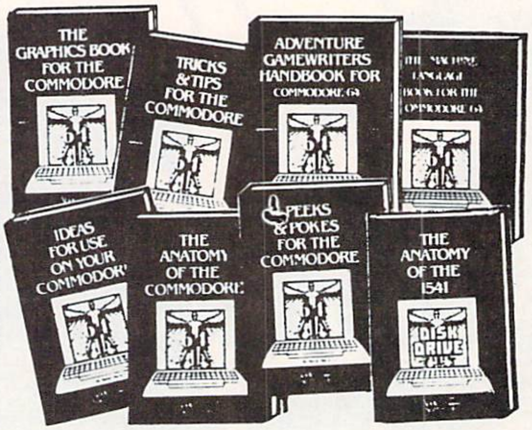
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```
30 ...INCREASE SPEED...
40 ...DISPLAY MESSAGE...
50 ....CONTINUE....
...
499 END
500 ...PUT UP SHIELDS...
510 ...FIRE RETROS...
520 ...DISPLAY MESSAGE... : RETURN
```

Now the program flow is significantly more difficult to follow. Of course an experienced programmer (or at least the one who wrote the program) is usually able to figure out how the program works, given enough time, but the program is clearly awkward.

Even with the ELSE statement, multiple-statement branches may not be straightforward to implement. The example above might look like this:

```
10 IF (PARTSIZE) > 3 THEN GOSUB 500 : EL
SE GOSUB 600
20 ....CONTINUE....
...
499 END
500 ...(PARTICLE SIZE > 3 SUBROUTINE)...
599 RETURN
600 ...(PARTICLE SIZE NOT > 3 SUBROUTINE
)...
699 RETURN
```

LET US BEGIN (AND BEND)

This is a perfect application for the BEGIN/BEND construct. BEGIN and BEND surround several statements which are treated as a single statement. The example above now becomes:

```
10 IF (PARTSIZE) > 3 THEN BEGIN
20 ...PUT UP SHIELDS...
30 ...FIRE RETROS...
40 ...DISPLAY MESSAGE...
50 BEND : ELSE BEGIN
60 ...REMOVE SHIELDS...
70 ...INCREASE SPEED...
80 ...DISPLAY MESSAGE...
90 BEND
100 ....CONTINUE....
```

Using BEGIN/BEND can be somewhat tricky. Normally IF, THEN, and ELSE must all be on the same program line. If multiple program lines are used with BEGIN and BEND, BEGIN must be on the same line and immediately following THEN (line 10 above). After the statements associated with THEN, BEND: must immediately precede and be on the same line as ELSE.

If BEGIN/BEND is used with ELSE, BEGIN must be on the same line and immediately following ELSE (line 50 above). The BEND at the end of the ELSE clause could be at the end of the last statement, separated by a colon, but it is more visible and easier to interpret on its own line (line 90 above).

AROUND IN LOOPS

Computers are particularly adept at performing repetitious operations, namely looping. The FOR/NEXT statements in BASIC 2.0 provide a powerful type of looping, with automatic incrementing or decrementing of the loop variable. FOR/NEXT loops are useful when the number of loop repetitions is known in advance.

Frequently a block of statements is to be repeated until a certain condition has been met, and the number of repetitions is not known beforehand. For this type of looping, the IF/THEN statements are used in BASIC 2.0. For example, consider this simple random letter guessing game. (The computer doesn't give any clues. You merely guess! Perhaps it can be used for typing practice if you type the letters alphabetically.)

```
5 REM - GUESS A LETTER -
10 C$=CHR$(RND(1)*26+65)
20 GET A$: PRINT A$,
30 IF A$=C$ THEN 50
40 GOTO 20
50 PRINT"YOU GOT IT!"
```

With BASIC 7.0, there are several other ways of writing this program. The DO/LOOP statements define a block of instructions to be repeated. Lines 20 through 40 could be written as:

```
20 DO:GET A$:PRINT A$,
30 IF A$=C$ THEN 50
40 LOOP
```

These lines are repeated until A$ equals C$ in line 30 and the program branches to line 50.

It is possible to EXIT from the loop by changing line 30 to

```
30 IF A$=C$ THEN EXIT
```

If the condition in line 30 is met, execution continues with the statement following the LOOP statement in line 40. Using EXIT rather than the line number 50 clarifies the fact that this condition terminates the loop. (Also, when writing the program, you don't have to know the line number in advance.)

Even more useful options include the UNTIL and WHILE statements which may be used with either the DO or LOOP statements. We may rewrite lines 20 through 40 like this:

```
20 DO UNTIL A$=C$
30 GET A$:PRINT A$,
40 LOOP
```

or this:

```
20 DO
30 GET A$:PRINT A$,
```

```
40 LOOP UNTIL A$=C$
```

What is the difference between these two? Very simply, if the condition A$=C$ is true when line 20 is first executed, line 30 will never be executed in the first version whereas line 30 is always executed at least once in the second version.

To use the WHILE statement, the logic of the conditional test must be reversed. Lines 20 through 40 now look like this:

```
20 DO WHILE A$<>C$
30 GET A$:PRINT A$,
40 LOOP
```

Once again, the WHILE statement may be used in line 40 instead of line 20. Also line 30 is executed only in the latter case if A$=C$ initially.

Combining the EXIT statement with the DO/LOOP/WHILE or DO/LOOP/UNTIL statements provides even more flexibility in creating loops of any description.

This wide variety of program control statements allows the programmer to implement algorithms more naturally. Algorithms written in Pascal or Englishlike pseudocode are easily implemented in BASIC 7.0 because of its rich vocabulary.

SORTING THINGS OUT

As a practical example, we will take a sorting algorithm written in Pascal and convert it to BASIC 7.0 and then to BASIC 2.0. Once again, any program flow can be implemented with IF/THEN statements, but the results may be less readable and less natural than with higher-level constructs.

We will start with this slightly modified version of a Pascal algorithm for an "insertion sort" from *Algorithms* by Robert Sedgewick (Addison-Wesley, 1983).

```
20   A(0) = -1E38
130  FOR I=2 TO N DO
135       BEGIN
140         V=A(I) ; J=I;
150         WHILE A(J-1) > V DO
160           BEGIN A(J)=A(J-1) ; J=J-1
170         END;
180         A(J) = V
185       END;
190  END
```

This is an algorithm to sort an array into numerical order. The elements of the array to be sorted are A(1) through A(N) where N must be specified. This method takes the elements one at a time, inserting each in its proper place among the elements already sorted. Elements larger than the current element are simply moved one position to the right (larger j value), then the chosen element is put into the empty slot A(j).

A value which is smaller than any of the actual items to be sorted is given to element A(0). This allows the smallest item in the actual list to be inserted above it in line 160, when j equals 1. The line numbers in the algorithm correspond to the BASIC 7.0 implementation in the program *Insertion Sort 128* on page 88.

It is obvious that there is very little difference between the stated algorithm and its implementation in BASIC. The subroutine at line 220 fills the array with random numbers from 0 to 99 and prints their values. Then the insertion sort is performed beginning at line 110. Finally the subroutine at line 300 is called to print the sorted array elements.

Note that the indentations help to group the statements within a loop. Indentations may be created by pressing SHIFT-SPACE as the first character after the line number. Then type as many regular spaces as needed.

In this example, only lines 150 and 170 need to be changed to convert the program to BASIC 2.0 for the VIC 20 or the C-64. The array has been converted to a string array to show how text may be sorted as easily as numbers. (See *Insertion Sort 64* on page 88.)

Notice that the logic of the conditional statement in line 150 has been reversed in order that line 160 be executed under the same conditions in this program as it was in the previous program. The characters of the sample string in line 10 are sorted, including the spaces which appear at the front of the list.

It is not difficult to modify this program further in order to read values from DATA statements and sort them. Replace lines 10, 15, and 250 with the following:

```
10 N=20
15 REM CHANGE LINE 10 IF THERE ARE MORE
THAN 20 ITEMS
250 READ A$(K) : IF A$(K)="**" THEN N=K-
1 : GOTO 280
```

Also change semicolons to commas in lines 260 and 340.

The last item in the DATA statement should be **. Use these as sample DATA statements:

```
400 DATA MERCURY,VENUS,EARTH,MARS,JUPITE
R
410 DATA SATURN,URANUS,PLUTO,NEPTUNE,**
```

The program control statements within BASIC 7.0 are very flexible indeed. For users of BASIC 2.0, hopefully it is clear that any type of program branching can be implemented with the FOR/NEXT or IF/THEN statements available within that language, although care must be taken during the translation. For practice, get a book of algorithms and implement some. □

SEE PROGRAM LISTINGS ON PAGE 88

All the programs in this issue are available on the *Ahoy!* program disk. See page 31.

This month, Commodore Roots launches into a series of columns dealing with assembly language programming on the C-128 in 128 mode.

COMMODORE 128 ASSEMBLY LANGUAGE
Part I: Mapping the C-128

By Mark Andrews

The Commodore 128 is quite a computer in any programming language. But for the assembly language programmer, it's an especially fascinating machine.

From a programmer's as well as a user's point of view, the C-128 really is three computers in one. It can be used to write and run software for three different systems.

The secret behind the 128's versatility is a most unusual internal architecture. It is built around a microprocessor called the 8502, which has many exciting new features but is also compatible with the 6510 processor used in the Commodore 64. The C-128 also contains a Z-80 chip, which can be used to write and run programs designed for computers equipped with the CP/M operating system.

The main purpose of the C-128's Z-80 chip is to run business-oriented programs originally designed to be used with Radio Shack computers, Kaypro computers, and other CP/M machines. So, even though the Commodore 128 is CP/M-compatible and comes with a Z-80 assembler, it is unlikely that many C-128 owners will spend much time writing Z-80 assembly language programs. I also doubt that 128 owners will spend a lot of time writing C-64 programs, since the C-128 is such a superior machine.

In the next few editions of *Commodore Roots,* therefore, we'll be devoting most of our attention to writing assembly language programs designed to be run on the Commodore 128 in its native 128 mode.

THE C-128's MEMORY MAP

In order to program the 128 in assembly language, you'll have to become familiar with the machine's memory organization. So that's the first topic we'll address.

The Commodore 128 derives its name from the fact that it comes equipped with 128K of RAM. It also has almost 48K of ROM, and over 300K of additional RAM and ROM can theoretically be installed. In fact, the C-128 was designed to be a 512K computer that comes with 128K of RAM.

Those are some pretty impressive figures, especially when you consider that the 8502 chip used in the C-128, like the 6510 chip built into the C-64, is an 8-bit microprocessor. That means that it can address only 64K of memory at a time. So, even though the C-128 can store large amounts of data in its memory, it can't manipulate all of that data simultaneously.

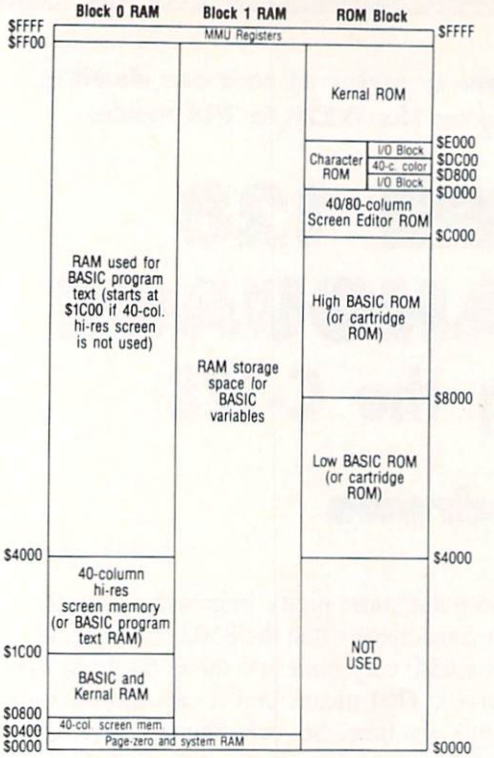
To handle the vast number of bytes that it can store, the C-128 relies on a programming technique called bank-switching. This technique—which was also used to expand the Apple IIc into a 128K computer—is illustrated in Figures 1 and 2 (on pages 26 and 28 respectively).

As Figure 1 shows, the C-128's memory can be divided into three blocks, which I've labeled Block 0, Block 1, and a ROM Block. (Technically, the C-128 also has a RAM Block 2 and a RAM Block 3, but Block 2 is currently identical to Block 0, and Block 3 is identical to Block 1.) Blocks 0 and 1 each contain 64K (or 65,535 bytes) of RAM. The ROM Block is a little smaller; it contains 48K of memory, almost all of it ROM.

Take a close look at the top of Figure 1, and you'll see that Block 0, Block 1, and the ROM Block all share a small strip of RAM at the very top of the C-128's memory. This segment of memory is called a Memory Management Unit, or MMU. It's only five bytes long—from memory address $FF00 to address $FF04—but it is the component that manages all of the C-128's bank-switching operations. Since it can be accessed from any block of memory, it can be used as a main switching station, moving from one memory block to another as it keeps watch over all of them simultaneously.

At the bottom of Figure 1, there's another small segment of RAM that's shared by Blocks 0 and 1. This portion of memory, which extends from $0000 to $0400, is occupied by Page Zero, the 8510 stack, and other important memory elements that are used by BASIC, user-written programs, and the C-128's operating system. This block of memory contains RAM, so it isn't accessible

FIGURE 1: C-128 RAM AND ROM BLOCKS



to the ROM block. But its contents are always available to RAM Blocks 0 and 1.

One interesting fact about the C-128 is that its built-in BASIC interpreter uses all three of the memory blocks illustrated in Figure 1. Although the BASIC interpreter itself resides in the ROM block, the RAM in which BASIC programs are stored is in Block 0, and the variables used in BASIC programs are stored in the whopping 64K of free RAM that's available in Block 1. So, when a BASIC program is running, the 128's MMU is almost constantly busy switching between one block of memory and another. All of this MMU activity is usually quite transparent to the BASIC programmer, since the C-128 is designed to take care of BASIC's bank-switching needs automatically.

Unfortunately, when the Commodore 128 is processing an assembly language program, there is nothing automatic about bank-switching. Then it's completely up to the programmer to take care of all bank-switching operations.

Luckily, with the help of a chart such as the one in Figure 1, the concept of bank-switching isn't too difficult to understand. Since the 8502 chip can see only 64K of memory at a time, it is up to the MMU to determine whether the 8502 is looking at Block 0, Block 1, or the ROM Block. To help it carry out this task, the MMU is equipped with a Configuration Register, situated at memory address $FF00. The Configuration Register has eight bits, which function as follows:

Bit 0 is used to determine whether addresses $D000 to $DFFF in the ROM block contain I/O ROM or character data. If Bit 0 of the Configuration Register is clear, then addresses $D000 through $D7FF and addresses $DC00 through $DFFF contain I/O ROM, while addresses $D800 through $D8FF contain color RAM for the C-128's 40-column screen. If Bit 0 is set, then addresses $D000 through $DFFF contain character-generator data. Of course this bit is significant only if the ROM Block is being accessed. When Block 0 or Block 1 is being accessed, addresses $D000 through $DFFF contain RAM.

Bit 1 of the Configuration Register determines whether the 8502 will access BASIC ROM or external-function ROM (a ROM cartridge) when it looks at addresses $4000 through $7FFF in the ROM Block. This bit is also significant only when the ROM Block is being accessed. When Block 0 or Block 1 is being accessed, addresses $4000 through $7FFF contain RAM.

Bits 2 and 3 determine whether the 8502 will see BASIC ROM, external ROM (a cartridge), or RAM when it looks at addresses $8000 through $BFFF. The settings of these bits are as follows:

00–BASIC ROM
01–Internal function ROM (not currently used)
10–External function ROM (cartridge)
11–RAM

Bits 4 and 5 determine whether the 8502 will see BASIC ROM, external ROM, or RAM when it looks at addresses $C000 through $CFFF and $E000 through $FEFF. The settings of these bits are the same as those for bits 2 and 3.

Bits 6 and 7 are used to determine whether the 8502 will see RAM from Block 0 or RAM from Block 1 in memory addresses $0000 through $FEFF and from $FF05 to $FFFF. The settings of these bits are:

00–RAM from Block 0
01–RAM from Block 1
10–RAM from Block 2 (identical to Block 0)
11–RAM from Block 3 (identical to Block 1)

THE C-128's 15 MEMORY BANKS

Figuring out what memory blocks to use, and how to use them, can be quite a challenging feat. Fortunately, the engineers who designed the C-128 have provided us with a number of helpful programming aids. For example, the C-128 has 15 predetermined memory arrangements that can be incorporated into any program with the help of an easy-to-use Kernal call. Each of these configurations is called a memory bank–a term that can be somewhat confusing, since the word bank, in this context, refers to a preset configuration of memory blocks rather than to a contiguous memory bank.

To lessen the confusion a little, it is helpful to know that most of the C-128's 15 memory banks will rarely, if ever, be of much concern to the average user. Some of the banks are identical to others, and some are designed to be used with memory expansion cartridges and

other kinds of ROMs. When the superfluous memory banks are eliminated, only four important memory configurations remain. These banks and their contents are illustrated in Figure 2 (page 28). Their bank numbers, addresses, and contents are:

Bank #	Addresses	Contents
0	$0000-$FEFF	RAM from Block 0
	$FF00-$FF04	MMU
	$FF05-$FFFF	RAM from Block 0
1	$0000-$03FF	RAM from Block 0
	$0400-$FEFF	RAM from Block 1
	$FF00-$FF04	MMU
	$FF05-$FFFF	RAM from Block 1
14	$0000-$3FFF	RAM from Block 0
	$4000-$BFFF	BASIC ROM
	$C000-$CFFF	40/80 column screen editor ROM
	$D000-$DFFF	Character ROM
	$E000-$FEFF	Kernal ROM
	$FF00-$FF04	MMU
	$FF05-$FFFF	Kernal ROM
15	$0000-$3FFF	RAM from Block 0
	$4000-$BFFF	BASIC ROM
	$C000-$CFFF	40/80 column screen editor ROM
	$D000-$DFFF	I/O and 40 column color map
	$E000-$FEFF	Kernal ROM
	$FF00-$FF04	MMU
	$FF05-$FFFF	Kernal ROM

As the above chart shows, Memory Banks 0 and 1 are very similar to each other, and Banks 14 and 15 are also very much alike. From $0000 through $3FFF, in fact, all four banks are identical—at least from a read-only point of view. When data is to be *written* to RAM in the $0000-$3FFF block of memory, the 8510 chip must be set to access the specific RAM block that will be used. But when data is to be *read* from RAM, any of the 128's four banks can be used, since they are all designed to read RAM from Block 0. From $4000 through $FEFF, Banks 0 and 1 both contain RAM, but Bank 0 takes its RAM from Block 0, while Bank 1 takes its RAM from Block 1.

From a read-only standpoint, Banks 14 and 15 are identical except for the segment of memory that extends from $D000 through $DFFF. In this range of memory, Bank 14 contains character ROM, while Bank 15 contains I/O ROM and 40-column color RAM.

In all four banks, memory addresses $FF00 through $FF04 are occupied by the 8510's Memory Management Unit (MMU). In Banks 0 and 1, though, the MMU is surrounded by RAM, while in Banks 14 and 15 it is an island in a sea of ROM.

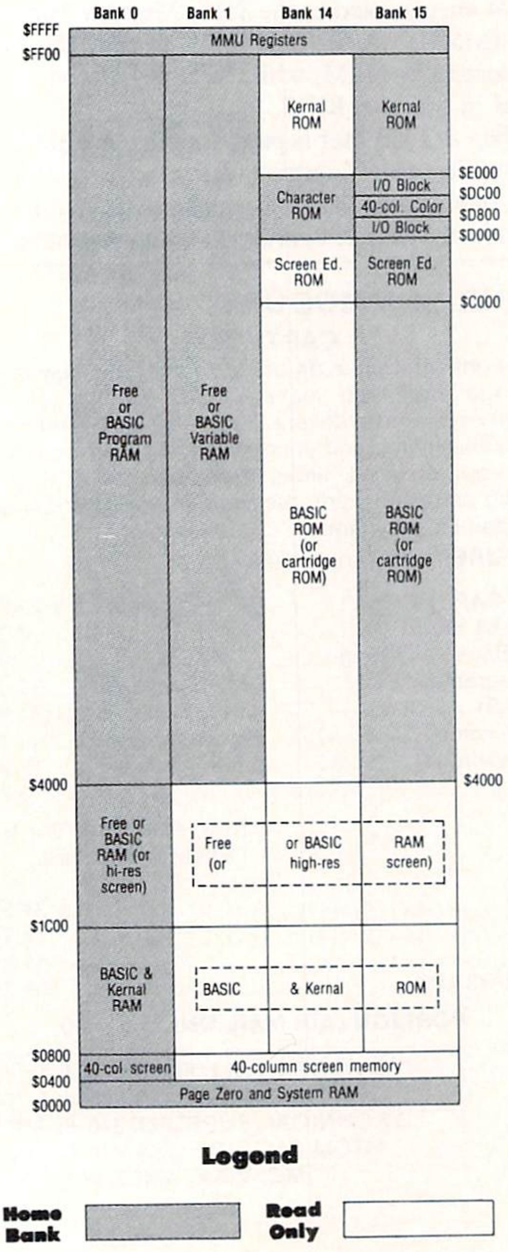
When a C-128 user is programming in BASIC, there's a convenient BANK instruction that can be used to switch from one memory bank to another. All you have to do is follow the BANK instruction with the number of the

bank you want to switch to – BANK 0 to switch to Bank 0, BANK 1 to switch to Bank 1, and so on.

Things are not that simple, of course, for the C-128 assembly language programmer. In assembly language, the most direct way to switch banks is to place a value in memory address $FF00, the 8510 Configuration Register. As pointed out earlier in this column, however, the number that must be stored in $FF00 to switch banks doesn't usually have much similarity to the number of the bank that is being switched to. For example, in order to switch to Memory Bank 15 in 8510 assembly language, the number that must be stored in memory address $FF00 is not 15, but 0.

Another way to switch to Bank 0, Bank 1, or Bank 14 (this trick will work only for those three banks) is

FIGURE 2: THE FOUR MOST IMPORTANT C-128 MEMORY BANKS



to store a value – any value – in MMU Register $FF01, $FF02, or $FF03. Storing a value in $FF01 will switch to Bank 0, placing a value in $FF02 will switch to Bank 1, and putting something in $FF03 will switch to Bank 14.

The C-128 Kernal also offers some handy utilities for switching from one memory bank to another. One of these is a subroutine called GETCFG, which starts at memory address $FF6B. To use the GETCFG call, all you have to do is load the 8510 X register with the actual number of the bank you want to switch to (0-15), and then do a JSR GETCFG (jump to subroutine $FF6B). The value that must be stored in $FF00 to switch to the desired bank will then be returned in the accumulator, so a switch can be made to that bank with a simple assembly language statement such as STA $FF00.

To use the GETCFG call, of course, you must be in Bank 15, since that's the home bank of the Kernal ROM in which the routine resides. This restriction also applies to all other Kernal-based bank-switching subroutines.

Two other Kernal routines that can be used in bank-switching operations are INDFET (address $FF74) and INDSTA (address $FF77). INDFET can be used to fetch a byte of data from any bank using an operation that emulates indirect indexed (zero-page Y) addressing. INDSTA can be used to store a byte in any bank using an emulation of the same type of addressing. Indirect indexed addressing, as old hands at 6502 assembly language know, is the addressing method that is written using the syntax LDA (nnnn),Y.

To use the INDFET Kernal call, you first have to store the base address that you want to use in a zero-page pointer (this procedure must also be followed for standard indirect indexed addressing). Next, the accumulator must be loaded with the pointer's zero-page address, the X register must be loaded with the desired bank number, the Y register must be loaded with the index (the same as in standard zero-page Y addressing), and INDFET must be called with a JSR instruction. INDFET will return with the desired byte from the desired address stored in the accumulator, but the C-128 will remain in the bank that it started out in.

INDSTA works much like INDFET, but in the opposite direction. To use INDSTA, the programmer must store the base address in a page-zero pointer, store the address of the pointer in memory address $02B9, load the accumulator with the byte to store, load the X register with the bank number, load the Y register with the index, and do a JSR to $FF77. The desired byte will then be stored in the desired address in the desired bank, but the original bank setting of the C-128 will not change.

The programs that accompany this column, designed to be used in 40-column mode, illustrate several ways in which bank-switching can be used to copy and modify the C-128's built-in character set. As previously noted, the 128's character data resides in ROM Bank 14. Since this character data is built into ROM, it cannot be written to, so there is no direct way to modify the C-128's built-in character data. By using bank-switching tech-

niques, however, it is possible to copy the 128's character data into RAM, modify it, and then use it by informing the C-128's VIC-II video chip of its new location.

The listing titled COPYCHRS.BAS on page 84 is a BASIC program that copies the C-128's character set from Bank 14 ROM into Bank 0 RAM. The program then modifies the character "@" into a hollow square, and uses that square as a cursor for typing on the screen.

In lines 20 and 40 of COPYCHRS.BAS, the VIC-II chip is told where the new character set is going to be. The C-128's VIC chip is just like the C-64's, and—except for some minor differences caused by bank-switching—operates in exactly the same way. I've discussed the operation of the VIC chip before, and no doubt will again do so in this series of C-128 columns. But for now, let's just say that lines 20 and 40 provide the VIC chip with the information it needs to find our new set of characters.

In line 30 of COPYCHRS.BAS, the start of RAM used for BASIC is moved up to memory address $4000 so that our new character set won't interfere with the BASIC program that creates it. Next, in lines 50 through 70, the 128's built-in character set is copied from Bank 14 ROM into Bank 0 RAM. Its new address in RAM starts at memory address $2000—a section of memory reserved for a bit-mapped screen map when high-resolution graphics are used, but free for just about any other use when BASIC is moved out of the way and hi-res graphics are not needed.

Type the COPYCHRS.BAS program and run it, and you'll see that it takes quite a long time to copy a character set using BASIC, even when the operation of the 8510 chip is speeded up with a FAST instruction. A modification of the program, which we'll call COPYCHRS2.BAS, improves matters considerably by calling a machine language subroutine. COPYCHRS2.BAS is created by removing lines 50 and 70 of COPYCHRS.BAS and changing line 60 to read:

```
60 BLOAD "COPYCHRS.O":SYS 4864
```

This line loads and executes a machine language routine called COPYCHRS.O. COPYCHRS.O was generated by an assembly language program, COPYCHRS.S, which appears on page 84. COPYCHRS.S was written on a C-128 assembler called *TSDS,* manufactured by the NoSync software company in Port Coquitlam, BC. With minor changes, the program could also be written and assembled using a *Merlin 64,* a *Commodore 64 Macro Assembler* system, or any other assembler that can be used with the Commodore 128 in either C-64 or C-128 mode. If you don't have any assembler at all, you could even write and assemble the program using the C-128's built-in monitor, but then you'd have to convert all the labels and symbols in the program to their actual memory addresses.

As you can see by looking at line 1340 of COPYCHRS.S, it does most of its work while sitting in Memory Bank 15, the home bank of the C-128's built-in BASIC interpreter. To move the 128's character set from ROM into Bank 0 RAM, the program uses a standard type of memory-copying algorithm that extends from line 1140 to line 1540. Line 1030 stores the program in a block of memory starting at Bank 0, address $1300—a good block of RAM to use for short to medium length assembly language programs, since it is reserved for foreign language utilities and function key definitions and contains more than 2K of RAM.

To fetch character data from Bank 14, the COPYCHRS.S program uses a subroutine called GETDATA that starts at line 1570. GETDATA uses the Kernal call INDFET to fetch the data that it needs and then uses a subroutine called STORDATA (which starts at line 1690) to store the data in Bank 0 RAM. STORDATA places an arbitrary value in MMU register $FF01 to switch to Bank 0, and then uses a standard indirect indexed addressing instruction—STA (MVDEST),Y—to store the needed data in Bank 0. Then it returns to Bank 15 by storing a zero in $FF00.

Assemble the COPYCHRS.S program and store it on a disk, then run it using the COPYCHRS2.BAS program. You'll immediately see how an assembly language routine can speed up a character-copying operation.

Next month we'll talk about generating high-resolution graphics on the C-128 in its 40-column mode. □

SEE PROGRAM LISTINGS ON PAGE 84

WORDCOUNT

For the C-128 and C-64

By Bert Halverson

Writers have to know how many words they've cranked through the keyboard when the manuscript is finished. Students must mind the mark when the instructor says he wants a certain number of words in a term paper. *Wordcount* is an all-BASIC routine that does the job without producing the inevitable mistakes and blurred vision of hand-counting.

The program will run on the C-128 in either mode, or on a "generic" C-64, and it doesn't care whether you have a 40- or 80-column screen. It does, however, insist on sequential files.

If you LIST *Wordcount* in C-64 after SAVEing it from the C-128 mode, you will see some strange squigglies that make no sense at all. Do not try to edit them! They are special C-128 commands which the C-64 doesn't know how to interpret. For that reason you must SAVE *Wordcount* in the C-128 mode if you want it to run on both computers. If you save it in the C-64 mode—or with a "real" C-64—it will crash on the C-128.

To see the count so far, simply press any printable key and the latest total will appear on the screen. Pressing RUN/STOP in C-128 mode completely aborts the program and closes all files; in C-64 mode you will have to close the files yourself. After a RUN/STOP, enter CLOSE1 and press RETURN.

If your text contains numbers and you don't want them counted, just type "N" and press RETURN when prompted.

Wordcount begins by finding out what kind of computer it's driving. DS$ in line 5 will contain the disk drive status in C-128 mode, nothing in C-64 mode. If it's a C-128, line 10 checks screen size by trying to define an 80-column display. If you have a 40-column screen, line 190 will set S equal to 40 and print a message warning that the screen will go blank during certain operations. S is then used as a flag to toggle the screen visible and invisible as needed, or to avoid unique C-128 commands if you're in C-64 mode.

The real work begins in line 20. *Wordcount* starts dragging your file in from the disk, one byte at a time, until lines 30-40 find the beginning of the first word. (The definition of a character was set in lines 150 and 160 when you decided whether or not to count numbers. Because the Commodore ASCII codes for certain punctuation characters (i.e., ASC 58-64) are numbered with the ABC's we're looking for, line 35 has to watch for them and treat them like spaces.

Lines 45-75 loop until lines 65 and 70 detect a space or other character marking the *end* of the word and increment the counter (W). Hyphenated words count as two. Line 50 prints the total so far if you push any printable key while the count is going on, and line 60 catches apostrophes, which must be treated as characters so the letter that follows won't be counted as a separate word. Once the *end* is found, the whole process starts over in line 20.

Some readers might wonder why line 35 uses two IF-THENs instead of the shorter AND operator. The answer is *speed*. AND would force the processor to check *both* halves of the statement to decide whether to go to 20 or fall through to 40. As it is, if L is not greater than 57, there's no need to see if it's smaller than 65, since both must be true for the branch to occur.

This simple test may surprise you:

```
10 J=TI:FORX=0TO1000
15 IFL>57ANDL<65THEN20
20 NEXT:J1=TI:PRINT"'AND' TOOK"(J1-J)/60
"SECONDS"
25 PRINT:PRINT"STAND BY...":PRINT
30 J=TI:FORX=0TO1000
35 IFL>57THENIFL<65THEN40
40 NEXT:J1=TI:PRINT"IF-THENS TOOK"(J1-J)
/60"SECONDS!"
45 END
```

The *Bug Repellent* line codes listed after each line of the program are valid for either the *C-64* or *C-128 Bug Repellent*. Be sure to use the proper *Bug Repllent* for your computer. ☐

SEE PROGRAM LISTING ON PAGE 96



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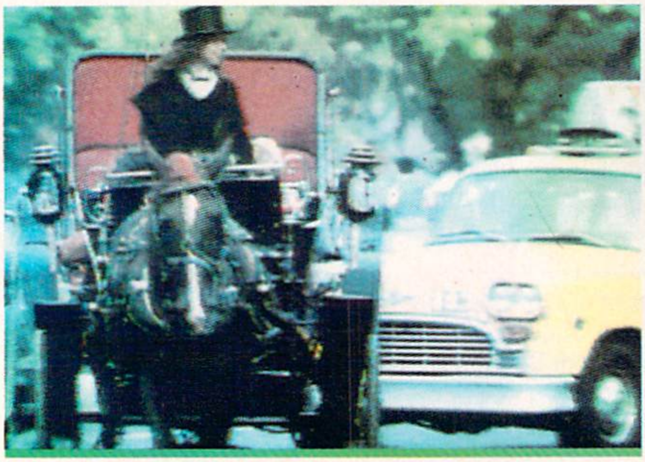
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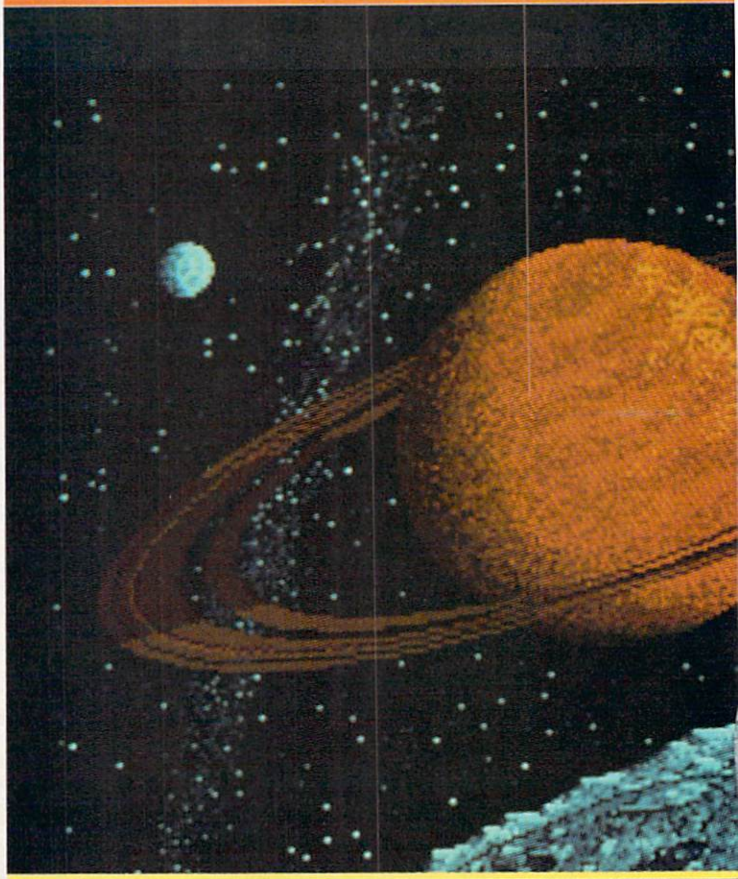
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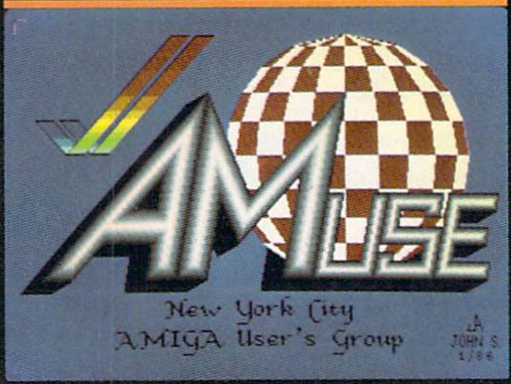
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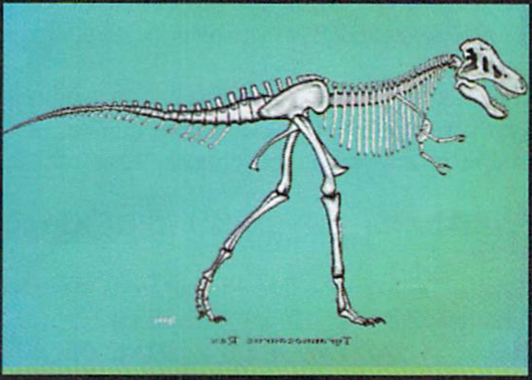




Because Morton Kevelson's analysis of the Amiga 1000 operating system (see page 53) ran longer than we expected, we couldn't publish as many examples of the Amiga's dazzling graphics capabilities as we'd planned. This heartbreaking situation has been resolved by turning this month's Art Gallery *over to Amiga images. Ace* Ahoy! *programmer Bob Spirko contributed the bulbous* Frog *that graces this page and our cover—a low resolution, 32-color image—along with the high resolution* World, T-Rex, *and* Fontaine *along the bottom. On the bottom at the extreme left is a photograph digitized with* Digiview *(call 913-354-9332 for information). Above is the logo of New York City's Amiga Users Group, drawn in low-res by John Song (Bronx, NY), and a low-res image generated by Electronic Arts'* Kaleidoscope *program (see page 60 for another). The two large outer space photos to the left came to us through the public domain. Anonymous artists, please write to us to be properly credited.*









FIDGITS' MUSIC SCHOOL

For the C-64

By Walter E. Meyers

Psychologists have known for many years that different people learn best in different ways. Some have to see something before they understand it; they rely on visual memory. Others have memories that work best with what they hear: call their orientation "auditory." Still others need to do something to remember it—their memory, we might say, is in their muscles. The great basketball player or dancer, the typist who glides through 80 words a minute, probably learns best by *moving* through a task; we can label that person's memory preference "kinetic."

A minute's reflection on how schools work tells you that they are designed to work best for people who prefer to hear things: teachers tell things to pupils. The eye is secondary to the ear. Notice that we lump together movies, slides, filmstrips, and educational TV under the term "visual *aids*"; rather than being primary in teaching, such things aid or help the ear.

Clearly, though, the best way to teach something is to appeal to as many different senses as possible: have the student see something, hear something, and do something all at the same time. Then provide immediate feedback: let the student know right away if the answer is right or wrong. Finally, reward right answers, but don't make it impossible to get the prize. If a lesson rewards the student for 10 right answers out of 10 questions, some students have only frustration in store because they learn more slowly than others. But if the point of teaching is to have the student master the material, then it does not matter whether the student gets 10 out of 10 right or 100 out of 100 as long as he or she eventually learns the material.

These are the principles on which *Fidgits* (August 1985 *Ahoy!*) was built, and the same principles underly *Fidgits' Music School.*

Here the Fidgits teach the positions of notes on the musical scale (on both G and F clefs), the letter names of the notes, the sounds of those notes, and their positions on a piano keyboard. Here's how it works.

After the Fidgits logo at the start of the game, the instructions appear. While you're reading them, the program is POKEing a customized character set into memory. At this point, the program has already put 51 words into an array of strings. When the game begins, one of those strings will be chosen.

All the words are made from the names of the C-scale notes—A, B, C, D, E, F, and G. First, the clef that you've chosen—treble or bass—will appear beneath a section of the piano keyboard. The program takes the randomly selected string—let's say it's BABE—and looks at it letter by letter. The first one is B, so the program places a note-shaped sprite on the right space or line and prints a Fidgit beneath it. After it does this four times, we have a staff with the notes, B, A, B, and E on it, and four fidgits with blank sweaters underneath.

Now input begins. The first note and the first Fidgit's sweater turn white as a prompt to enter the name of the note. If you enter B, the reward is immediate and multiple: the Fidgit sings the note, B is printed on his sweater, the letter B appears on the correct key on the keyboard, and the note on the staff turns red. There is no Bronx cheer or similar punishment for a wrong answer: if you hit any other key, the Fidgit scrunches down and waits for another try. The only "penalty" for a mistake is that the note will remain white after you get the right answer, drawing your attention to the line or space you had trouble with.

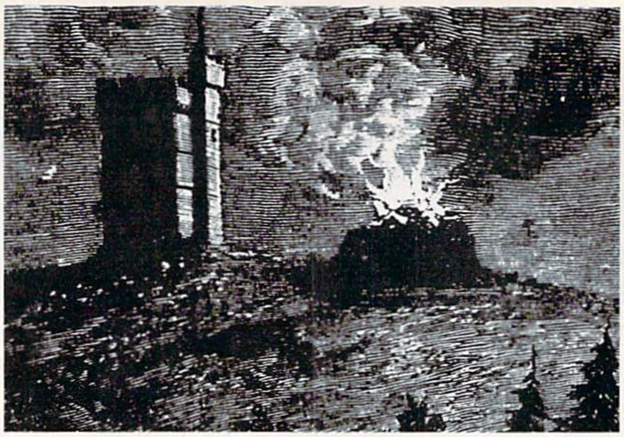
When you've got the whole string right, there is another reward: the sweaters of the Fidgits now spell out the word hidden in the musical phrase, and they show off by singing the phrase through, this time in major chords. After seven words, the program asks you if you want to play again and gives you an opportunity to change the clef.

If your user is someone whose attention span is a little short for seven words, you can set the number of words in a round to any value you choose. Line 650 reads

```
650 GAME=GAME+1:IF GAME<7 THEN 350
```

Just remove "7" from the line and put in its place whichever number you like. Happy Fidgeting! ☐

SEE PROGRAM LISTING ON PAGE 84



ESCAPE FROM SKULL CASTLE

For the C-64

By James C. Hilty

The old mansion at the top of the hill had seemingly been deserted for years. The elements had eaten away at the huge entrance door until it resembled a skull, and the building itself was often referred to as Skull Castle. Once in a while someone would take a walk up to the aging structure to look around. Usually this person would never be heard of again Some actually claim to have heard music and the sound of dancing coming from the "castle."

One stormy day you decide that you can stand the mystery no longer. You take a walk to Skull Castle and decide to go inside. What you see is astounding. Skulls and skeletons are flying around everywhere. You hear voices. The people that were never heard from are calling you for help. Your attention is diverted by a poster on the wall: "TONIGHT ONLY–SEE THE DANCING SKELETTES!" You must help the others escape by finding four keys to unlock the doors which they are trapped behind. But beware the Skull of Skull Castle!

Escape From Skull Castle is an 'arcadventure' for the Commodore 64. An 'arcadventure' is an arcade game which uses an adventure game theme. There are elements from both types of games, but is played mainly as an arcade game. You accomplish a goal as in an adventure game, and you score points as in an arcade game.

THE GAME

The title screen shows an outside view of Skull Castle. The playing screen takes you inside the castle. Small skull chasers surround the playing screen. Skeletons and different color skelettes are placed around the playing area. You are the figure at the bottom left.

You begin the game with four players. A red key is located at the right side of the screen. Your goal is to get four keys before time runs out on the clock. Moving your player with the joystick, you must avoid everything in the castle except the key. You have plenty of time to get the keys before the clock runs out. By studying the various movement patterns of the skeletons and skelettes, you can plan the best path to the key. You will find "safe" areas on the screen where you can wait until it is safe to grab a key.

If a skeleton, skull chaser, or skelette gets you, you will get to see the dancing skelettes. These skull-like creatures will sprout arms and legs and do a little dance while you lose a man. If you lose all four men, the game is over. If you get four keys, you receive bonus points and the timer is set back to the beginning, giving you the chance to save someone else. You also receive 100 points for every key that you manage to get. You will need to develop a good deal of speed and strategy to be successful in your rescue attempts.

GRAPHICS

Escape From Skull Castle features many realistic graphics that were achieved in different ways. I wanted the castle to be as realistic as possible and first considered bit-mapping the title screen. This, however, would have involved using machine language bit map routines as well as a lot of DATA statements. Instead, I chose to use custom characters. 57 custom characters were defined and put at screen codes 128 to 187 (the reverse character code). By using PRINT statements, the title and playing screens were created. The skull-like door on the castle consists of 54 custom characters which I designed by literally taping pieces of graph paper together. Custom characters also make up the skull chasers and the skeletons. The playing figure, key, and the skelettes are sprites which rotate through different sprite pointers to animate them. The sprites are moved by an interrupt routine, and a machine language routine combines with random numbers to move the characters on the screen. Most of the time spent designing this game was spent on graphics design away from the computer. Character and sprite editors are great tools, but I still find pleasure in designing graphics using graph paper and then transferring my work to the computer.

TOTAL EFFECT

By combining graphics with sound and an offbeat story, I hoped to create an environment that was a little scary and at the same time humorous. The dancing skelettes add comic relief, and they make losing a man a little easier to take.

Computer games are for enjoyment. They are the comic books of the '80's. I enjoyed writing *Escape From Skull Castle*, and hope that you enjoy playing it. Beware of the Skull who lives in Skull Castle, and say hello to the dancing skelettes for me. ☐

SEE PROGRAM LISTING ON PAGE 90



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SCREEN SLEUTH



For the C-64

By Buck Childress

Ever meet the PEEK and POKE Mob? They're the meanies that attack your brain while you're frantically scrambling to find the codes and locations for those splendid graphics you want to add to your latest creation. You just finished moving all around the screen printing neat little characters to pick and choose from. Those little jewels in each carefully selected location will put the finishing touches on that soon-to-be masterpiece. Now, if you can just figure out what they are and where to POKE 'em before the PEEK and POKE Mob steals your overwrought brain, the program of the century will be complete. You'll know if the Mob has you in its grip when you start mumbling something about hideouts and two guys in a police car. Don't let the PEEK and POKE Mob escape with your brain. Capture 'em out with *Screen Sleuth!*

Screen Sleuth instantly lets you know the CHR$ and POKE codes, character color number, and screen and color RAM locations of any character on the screen, even custom characters. If you spend much time with graphics, *Screen Sleuth* will be a brain saver.

After saving a copy of *Screen Sleuth* you can run it. The loader will poke the machine language data into memory and *Screen Sleuth* will be ready for patrol. Now type SYS 49152 and press RETURN.

To go *Sleuth*ing, just cursor to the character in question and press the RUN STOP key, then release it (don't press RESTORE). *Screen Sleuth* waits for the RUN STOP key to be released so that it won't interfere if you're in the process of listing or stopping a program. The top line of your screen will clear and a lineup of five numbers will appear. Their identities, from left to right, are CHR$ (ASCII) code, POKE (character display) code, character color number, screen RAM location, and color RAM location. An asterisk (*) after the CHR$ number signifies a reversed character. A question mark (?) in place of the CHR$ number means a match between the CHR$ number and POKE code wasn't found (highly unlikely). The numbers are printed in black so that they'll show up against any screen color. If the screen color happens to be black, don't panic. The numbers will automatically be printed in white.

To return things to normal, press any key (except RESTORE). Whatever was originally on the top line of the screen will reappear along with all of the corresponding colors. The cursor will return to its original position and color as well. Everything will be just as it was before. It's as simple as that. You can cursor all over and investigate as many things as you like without disturbing anything on the screen.

Screen Sleuth is headquartered in a free area of RAM from 49152 through 49609, so you can load, save, and run programs on a non-interference basis, providing they don't put data in *Screen Sleuth's* headquarters. If for some reason you want to disable *Screen Sleuth*, press the RUN STOP/RESTORE combination. SYS 49152 will reenable it.

If you want "just the facts," call on *Screen Sleuth!* □

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COMB

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CHECK-MATE!

Chess Programs for the Commodore 64

By Ted Salamone

Featured This Month:

Finding a decent opponent for chess is only a little less difficult than meeting Ms. or Mr. Right in the local singles bar. In some ways it is even harder.

After all, you not only want a pleasant person who is gracious in defeat and magnanimous in victory, but he or she should be fairly close to you in ability so that the contest will be more or less evenly matched.

Computer chess answers all these needs. Of course, it can't provide the same warm companionship as a human opponent, but pawn-pushing programs compensate by presenting a dazzling array of options and, in most cases, precisely adjustable difficulty settings.

Consumers on a shoestring will especially appreciate a new chess title from Green Valley Publishing (a.k.a. ShareData). The publisher has released *Chess Champion* as part of its $8.00-a-disk "Load 'N' Go" line. The newest title on the market, it includes operating instructions, but not the rules of chess, right on the disk.

The chessist enters moves using a grid system which labels ranks "A" through "H" and marks the files "1" through "8". The move-codes are simple. For instance, D2-D4 specifies the shift of a pawn from square D2 to square D4.

The function keys permit the gamer to list (onscreen) all the previous moves, changes the board setup, or start a new game. Seven levels of play are available. The user can elect to play the Black or White and take back moves, though the instructions do not properly explain the latter procedure. You cannot force the computer to move if it takes too long to respond, and there's no "Help" feature.

On a brighter note, the program automatically invalidates illegal moves. *Champion* displays an error message, identifying any problem which is preventing the disk from functioning smoothly.

The graphics feature crisp black and white pieces on blue and light blue squares. The appearance of the display also suggests that this program is derived, at least in part, from the *Sargon* programs. *Champion Chess* cannot be used as an electronic board by two human opponents; only solitaire play is possible.

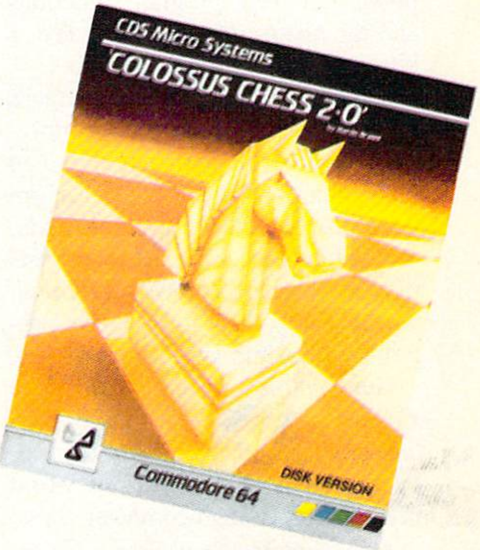
Despite these problems, *Champion Chess* is a surprisingly strong basic chess program. At the price, novices can afford to test the waters with this one.

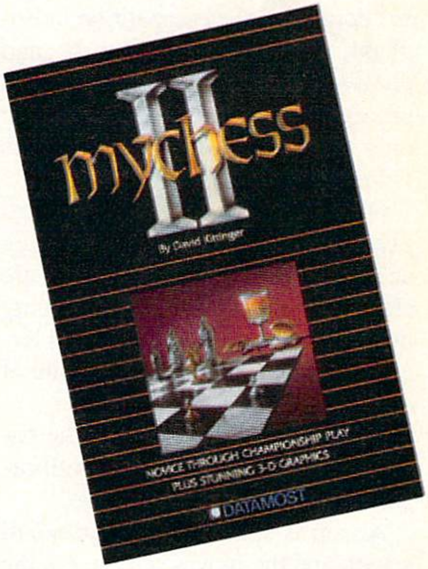
Sargon II (Hayden) is packaged with written documentation, but the booklet covers little more than how to operate the disk. This seems a sad omission for what is generally billed as an entry level program.

Sargon II itself is well-suited to beginning chessists. It incorporates an invaluable "hint" mode, offers seven levels of play, lets players take back moves and revise the board position, reviews previous moves, and gives a choice of the black or white pieces.

Artworx Software offers a package entitled *Grandmaster Chess*. Though more recent programs have surpassed it in competitive power, it still offers some unique elements.

Users can alter the color of the board squares or the background. Some very interesting combinations are possible with the C-64's 16-color range. Besides their aesthetic appeal, different colored boards help reduce eyestrain during long sessions.





Colossus Chess *(top): six play modes.*
READER SERVICE NO. 102

Mychess II *(bottom): feature-filled.*
READER SERVICE NO. 103

Grandmaster allows the human participant to force the computer's moves, restart games at any time, switch sides, or recall moves. Unfortunately, the "take back" feature only erases each side's most recent move.

On the plus side, there are 10 levels of difficulty, one of which is specifically designed for postal chess. The visuals are clean but sparse two-dimensional representations of traditional pieces.

The user manual is brief and to the point. It covers program functions and the history of chess. The text is bilingual, French and English.

An onscreen digital clock tracks the time each side spends per move. This is a useful item not found in many other packages. The list of options also includes a tutorial mode, in which the computer suggests moves upon request. Overall, *Grandmaster Chess* is an inexpensive program with some very nice features.

New on this side of the Atlantic is *Colossus Chess 2.0.* Originally published in Europe, it comes to the U.S. by way of Canada. Seems the world just can't get enough computer chess!

According to the package, *Colossus* devastated the competition in England, including *Sargon II* and *Grandmaster.* (Most of the other programs mentioned in this hype run only on machines available in the United Kingdom.)

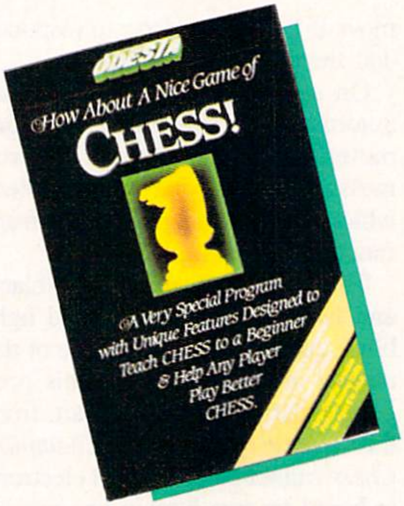
Of course, which chess program plays at the highest level is largely academic. Since few humans are chess masters, the ability or inability of a chess title to play at this skill level is less important than the menu of options the program provides.

A bilingual flyer explains the basics of chess. The manual is well-organized and very informative.

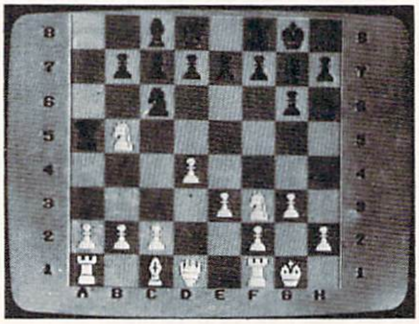
Action is split between the board screen and the moves screen. On the former, neatly executed two-dimensional figures portray the armies. The latter screen lists the last seven moves and the game clock. *Colossus Chess* also recognizes underpromotions, draws, and the "50 move" rule, just like the heavyweights.

Single keystrokes allow players to switch sides, force moves, recall (take back) up to 120 moves, or start a new game. A chess fancier can also set up the board to explore problems or study games-in-progress. Square and border colors are variable to reduce eyestrain. An "Invisible" mode facilitates the novelty of "blindfold" matches.

To enter a move, the gamer places the cursor on the "from" and "to" squares. It is possible to travel directly to distant ranks and files. This command works very much like the



Recommends moves, allows takebacks.
READER SERVICE NO. 293



Sargon III ***has 107 classic matches.***
READER SERVICE NO. 294

"Go To" feature in most spreadsheets.

Changing default settings, such as board colors, is convenient. Pressing the cursor keys cycles through the acceptable range of entries, thereby foolproofing the process. Younger players will especially appreciate such attention to detail.

Naturally, the program does not allow illegal moves or improper board setups. Plain English messages explain everything. Players can go head-to-head, battle the machine, or watch the C-64 compete against itself. The board flips to accommodate two human contenders, and a replay mode makes it simple to review an old contest. There's even slow motion! Unfortunately games can only be saved to tape.

Six modes of play encompass everything from handicap to problem solving. One mode is designed for postal chess. These modes are not to be equated with levels, however. The program's response speed is infinitely variable, which creates almost limitless levels of play.

An unusual feature of *Colossus Chess 2.0* is its ability to solve potential mate situations against itself! This feature is also useful for analyzing a match underway against a particularly pesky foe.

Colossus Chess 2.0 is a highly polished, professional product with blinding response. Free of foibles, it is as smooth as ice cream. A nice combination of features makes it a good choice for social players.

The first entry in the "heavyweight" division is also from Hayden. *Sargon III* is a worthy successor to the two earlier chess masterpieces in the series. It offers even more features and enhanced ease-of-play.

The black and white pieces are crisp, clear, and easily identifiable. The rank identifiers (A-H) are visible whenever the board is displayed, unlike *Sargon II* which allows them to be toggled on or off. Players can flip between the board view and the move listing screen.

Extensive documentation is another major advantage of this latest *Sargon.* The manual presents operating instructions, the basic rules of chess, and numerous problems.

Sargon III is a two-disk product. One loads the program, while the other has 45 chess problems and 107 of the greatest games in history.

Sargon III lets pawn-pushers take back moves, ask for help, force the computer's move, switch sides with the C-64, invert the board, or list all moves to the printer.

Other nice features include the ability to replay saved games, alter the board setup, or even print out the cur-

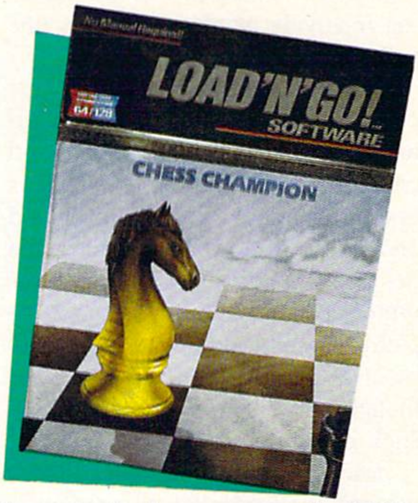
rent board position. The nine levels of play can be extended to eighteen if you prevent *Sargon III* from thinking during your turn. A human participant can compete against the computer, watch the program play both sides, or instruct it to verify moves between two human opponents.

Sargon III is an outstanding implementation of computer chess. It is suitable for everyone from first-time players to tournament-caliber performers.

Datamost's *Mychess II*, surprisingly powerful and chock full of features, is arguably the most well-rounded package for the C-64. The gamer uses keystroke commands to take back multiple, rotate the board (90 or 180 degrees), switch sides, or ask for help. It is also possible to change play level anytime, dump the moves to a printer, force the computer's move, or replay games. There are 128 great matches stored on the reverse side of the disk, all available for replay, analysis, or study.

As with *Sargon III, Mychess II's* nine levels of play can be expanded to eighteen, depending on whether or not the computer is permitted to plan moves during the human player's turn. Furthermore, you can choose between color or black and white pieces, select 2-D or 3-D board views, or play with any of several different piece sets (modern, traditional, etc.). Upon request, the program can highlight all legal moves for each side or identify offensive and defensive postures on designated squares.

Mychess II allows the user to play the computer, another person, or study an all-computer game. Online help is easily accessed, and variable board setup facilitates situation ana-



Strong basic chess program for $8.00.
READER SERVICE NO. 295

lysis.

Mychess II is graphically outstanding, well-designed, and packed with features. Even those who have never

INSIDE COMPUTER CHESS

How the Programs Work—and How to Beat Them

Like any other set of code, a computer chess program "teaches" the computer how to execute instructions. In this case, the program includes information on what each piece is worth and how it moves. The instruction set designates squares for identification and to verify the validity of moves. Positive and negative numeric representation makes this possible.

Besides value, a chess program must also consider a piece's mobility. The development of pieces during the game, a difficult concept for computers to understand, is accomplished by assigning points to each square. This weighting system enables the program to play in either a passive or aggressive manner.

Weighted proximity scores aid the program in evaluating situations which relate to attacking or defending pieces. A computerized chess game measures the distance between pieces to determine the status of every man on the board.

Openings are the easiest phase for computers. Most have a "book" from which they draw their first nine or ten moves. Since the start often determines the outcome, most commercial programs have sophisticated openings. The human competitor's best chance to quick success against an automated foe is to force the computer to depart from the tried and true preplanned moves. Play several games while noting the program's opening strategy. Then try an unorthodox line of attack to break the chain. The sooner done, the better.

Once past the opening phase, programs perform tree searches to identify possible moves. From a "root" position, the program adds the results and selects the branch which benefits its position the most while harming yours. The further ahead a program looks (the number of plays), the better its chances of making the correct long-term choice.

All this searching takes a tremendous toll on the CPU. A program looking ahead two complete moves encounters 1,000,000 combinations. This would take a prohibitive amount of time, except that use of the Alpha-Beta algorithm makes effective searches much less time-consuming. By examining root moves from right to left, instead of left to right, the algorithm more readily identifies inferior moves.

Computers are adept problem-solvers. Watch the computer analyze problems and emulate its approach.

Novices may find it wise to disable the program's "Think" mode, so it can't plot moves during your turn. Also, limit the depth of its searches if possible. These features can be turned on, or increased as the human competitor becomes more able.

Programs play at different speeds. Average response times range from five seconds per move to an infinite level where you have to force every move. Midlevel games are usually played with responses every one or two minutes. A human can handicap the computer a bit by identifying the speed at which it plays its weakest games.

Keep the Queen as long as possible. Retaining it forces the program to examine many more possibilities. By switching sides you can learn from the machine's defense against your onslaught. It's the next best thing to a private tutor.

The best preparation for middle and endgames is to study positions in detail. Analyze and explore various responses. If you can set up the board game as you wish, make use of it.

Most of all, play, play, and then play some more. Keep raising the skill level so that you almost win, but just fall short. This will give you something at which to aim, and the mind-stretching challenge will help you build up skill fairly quickly.

And don't forget to guard that King!

touched a chesspiece will find learning relatively painless with this fine piece of software.

How About A Nice Game Of Chess! comes complete with an ondisk tutorial which provides check and checkmate scenarios, numerous openings, middle game tactics, and endgame maneuvers. Besides the demo routine, this menu-driven program supports the keyboard, the AppleMouse, and paddles for the movement of pieces. For some reason, though, no provision is made for joystick control.

Instead of entering coordinates through the keyboard, movement is accomplished by placing the flashing cursor on the desired piece and then moving it to the target square. Pressing "Return" moves the designated piece.

The "Inward" option displays attacks and defenses on a selected square, and the "Outward" option highlights squares attacked and defended. Both of these functions automatically switch off after a move is selected.

How About A Nice Game Of Chess! recommends moves, allows take backs, and replays groups of moves or entire games. The chessist can also switch sides, alter board setup, play against the machine, duel a living, breathing antagonist, or watch the computer control both sides.

In addition to the nine levels of play, there is a practice mode for training purposes. The documentation is heavily geared towards such training. It goes into great detail concerning strategic and tactical maneuvers. It is by far the most comprehensive and informative "introductory" program.

Odesta's *Chess 7.0* resembles other topflight chess programs in appearance and functionality, but it has some additional bells and whistles. It also features the widest range of skill settings.

Besides the features found on comparable software titles, *Chess 7.0* has 30 replay games and a "Look" feature which depicts moves the computer expects in the current game.

The program provides hints as well as analysis within the replay mode. Computer v. computer, human against computer, or human v. human games are possible with this remarkable offering.

If you always wanted to learn to play chess and couldn't find someone to teach you the rudiments, or if you're a player who never seems to find enough viable opponents, computer chess is the answer. The software packages described above vary in price and features, but any of them is an open sesame to the world's most popular strategy game. □

Actionauts Availability

Actionauts, reviewed in the April issue of *Ahoy!*, is available in several different ways:

1. Free on the April 1986 *Ahoy!* disk magazine.

2. Free when downloaded from Advanced Programming Technology's Channel 64 BBS (415-322-3213).

For $10 from APT, Box 50246, Palo Alto, CA 94303.

This will hopefully dispel any confusion.

Products Mentioned in *Check-Mate!*:

Champion Chess
ShareData Inc.
7122 Shady Oak Road
Eden Prairie, MN 55344
Phone: 612-829-0409

Colossus Chess 2.0
Wilanta Arts
6943 Barrisdale Drive
Mississaugua, Ontario
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Phone: 416-858-9298

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150 North Main Street
Fairport, NY 14450
Phone: 800-828-6573

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20660 Nordhoff Street
Chatsworth, CA 91311-6152
Phone: 800-692-1649

Sargon II
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Hayden Software Company
600 Suffolk Street
Lowell, MA 01853
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LEADER BOARD
Access Software
Commodore 64
Disk; $39.95

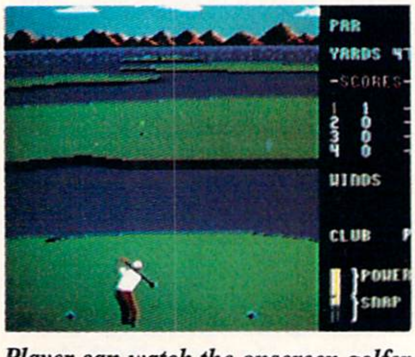
Attention golfers: You can stay home instead of trudging to the links at 6 a.m. on a rainy day to squeeze in a quick 18 holes. Bruce and Roger Carver have authored a golf simulation that is the next best thing to a sunny day on the fairways of your favorite course.



Leader Board *lets up to four golfers go 18 holes (out of 72 on the disk).*
READER SERVICE NO. 296

Leader Board packs 72 varied and picturesque holes on a single disk. One to four players alternate on a joystick plugged into Port 2. The gamer directs the onscreen golfer by picking options from menus located to the right of the three-quarter perspective course display.

One aspect of the loading procedure which must be mentioned is the security key. This little piece of plastic must be plugged into the cassette port of the Commodore in order to run the program disk. The game itself is unprotected, and the manufacturer gives permission to make back-



Player can watch the onscreen golfer, or the meter that reports the changing status of both power and snap.

up and file copies.

It's a novel approach to anti-piracy protection, but perhaps not the most practical one. People who discard the packaging and file the disks and documentation are going to have to find a special place for the security key.

The play-mechanics are unusual but they can be mastered with practice. Prior to the actual shot, the computerist moves the joystick left and right to position an aiming cursor which appears several (scale) feet in front of the golfer. Moving the stick forward and back selects from a menu of 14 clubs, including three woods and nine irons.

Depressing the action button locks in these choices and initiates the swing. The computerist must consider two factors at this juncture: power and snap. The closer to the top of the backswing the player releases the button, the greater the power.

The gamer pushes the button again to set the snap. The goal is to snap just as the head of the club connects with the ball for a straight shot. Pushing the button too soon causes the ball to hook to the left, while a late snap sends it slicing to the right.

Three levels of play allow the computerist to learn the routine a little at a time. "Novice" eliminates the possibility of a hook or slice as well as the effect of wind. "Amateur" requires the golfer to master snap as well as power. "Pro" introduces the influence of wind.

Although the drawings are not highly detailed, the overall visual effect is extremely pleasing. The layout of the holes is impressive, and some of them are truly beautiful. The chain of islands in hole #2 on course #1 is a personal favorite. The brightly clad golfer is well-animated, which makes it reasonably easy to time the elements of the swing. As an extra aid, a meter reports the changing status of both power and snap. Some gamers will actually find it easier to watch the gauge instead of the golfer. This probably improves performance, but at some aesthetic cost.

The documentation is clear and mercifully concise. One much-appreciated feature is the four-page section of course diagrams. They show the arrangement of each hole and include a distance scale which is a great aid in club selection.

Other computer golf simulations may be more minutely detailed than *Leader Board* but none does a better job of weaving the sport's essentials into an accurate yet highly playable format. The Carver Brothers, best-known until now for their *Beachhead* games, now demonstrate an incisive understanding of golf. This disk definitely scores a hole in one.

Access Software, 2561 South 1560 West Ste. A, Woods Cross, UT 84087 (phone: 801-298-9077). *–Arnie Katz*

PARTY SONGS
John Henry Software
Commodore 64
Disk; $15.95

Here's one way to keep a song in your heart! *Party Songs* is a disk full of fun for the younger set, the perfect accoutrement for a children's party. It turns the Commodore into a high-tech jukebox that plays a repertoire of favorite camp songs.

Party Songs' 18 selections are a potpourri of Americana. They include such classics as "Auld Lang Syne," "Dixie," "Bill Groggin's Goat," "My Bonnie," "Working on the Railroad," and 13 other tunes that almost everyone knows by heart.

The musical arrangements have few frills. This makes it easier to use *Party Songs* for group sing-alongs.

The program couldn't be simpler to use. A menu lists the 18 titles. Pressing a song's identifying letter makes that ditty play.
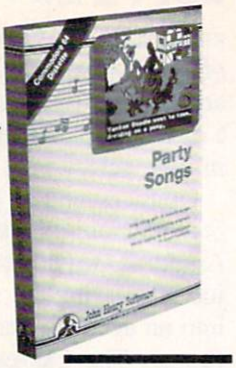
The computerist can also hear all the songs in rotation. This is a nice way to provide continuous music for parties. Each song's tempo can be speeded or slowed, and a pause feature can interrupt a song in mid-melody.

A mood-setting illustration accompanies each song. Some of these are exceptionally pretty. "Yankee Doodle" displays a picture of a gent and his lady dancing on the tavern green. "Yellow Rose of Texas" sports a sentimental scene of an officer bidding

his lady goodbye. "My Darling Clementine" depicts that big-footed lady herding a flock of ducklings, and "My Old Kentucky Home" is enhanced with a bucolic scene of a man sitting by his hearth, smoking his pipe, dog at his feet. All the drawings are well-rendered and add an atmospheric touch. Most are still paintings, but there are occasional touches of animation, like the rolling eyes of "Turkey in the Straw" bird, and, the best of the lot, a rebel soldier flipping nuts into his mouth and losing occasional "Goober Peas" to a thieving little bird.

Admittedly, the arrangements fall far short of demonstrating the musical abilities of the Commodore. But unlike programs designed to show the virtuosity of the computer, this one is deliberately simple.

The program displays the words line by line at the bottom of the screen, and the music is carefully scored to put it within easy vocal range. The accompaniment is purely melodic, without any arpeggios, fancy chords, or flourishes. This makes it easy for youngsters to stay with the tune.



18 sing-along selections include Red River Valley, My Old Kentucky Home, more. READER SERVICE NO. 297

Party Songs is a child-pleaser, and as such should brighten many birthday parties and scout meetings.

John Henry Software, P.O. Box 745, Vandalia, OH 45377 (phone: 513-898-7660). *—Joyce Worley*

BATTLE GROUP
Strategic Simulations
Commodore 64
Disk; $59.95

This disk is obviously a result of following the adage that when you've got a good thing, stick with it. It's not a true sequel, but rather extends concepts developed in an earlier simulation to new territory.

Gary Grigsby, who has done at least 10 war games for SSI, unearthed a gem of an idea in *Kampfgruppe.* That game covers the time period 1941-45 and puts all the armored weapons used by the Russians and Germans on the Eastern Front at the disposal of armchair commanders.

Kampfgruppe has great accuracy, historical detail, and flexibility, but it was its innovative game-system which won universal praise from critics and gamers. Major features of this classic include headquarter control of all units, variable response time to orders, and a very simple line-of-sight option.

Battle Group is almost a clone of that idea, though it covers a shorter time period (1943-45), and it involves a different set of foes. This time, computerists can direct the armored might of Germany or the forces of the United Kingdom and the United States.

If you already have and enjoy *Kampfgruppe,* there is little need to read this review further. Go out and buy *Battle Group;* you'll love it. The balance is addressed to those who have not as yet discovered the delights of these two superb programs.

Be forewarned that *Battle Group* is an advanced game. If you're just cutting your military gaming teeth and want to jump into World War II, it would be better to start with such SSI titles as *Battalion Commander, Panzer Grenadier,* or *Tigers In The Snow.* All are introductory games from the same time period which include armored warfare.

Battle Group allows a computerist to play either side against a computerized general or go head-to-head with another live opponent. Either side can be handicapped to aid a less experienced player.

The game comes with four historical scenarios and a design-your-own-scenario option. The design notes included with most military simulations advise one to play with included scenarios to learn the rules before creating an original scenario.

Not so with *Battle Group.* Author Grigsby encourages players to generate their own game situations right from the start. With free setup, the gamer can create a small-scale battle on simple terrain, which provides an easy way to learn the game-system. The four scenarios included on the disk are complex enough to test the fighting spirit of the most experienced wargamers.

The list of weapons is impressive. It includes tanks, tank destroyers, assault guns, self-propelled artillery, mortars, armored cars, troop carriers, anti-tank guns, machine guns, flamethrowers, and bazookas.

Don't be misled by the symbols into thinking of this as a platoon-level action. Even though each symbol on the screen represents a platoon, the computer figures hit possibilities for every weapon and man within each platoon.

Battle Group also has a couple of distinct improvements on the *Kampfgruppe* system. Grigsby isn't one to rest on his past successes. The new

rules limit stacking of platoons to two per square and also increase the chance that a unit will retreat if losses mount too high.

As with most SSI products, the documentation is 20 pages of pure gold. The *Battle Group* manual is a bit thin on historical information, which detracts from the total presentation, but there is little reason to fault what is included. Eight pages, liberally sprinkled with tables and illustrations, discuss the actual rules. The rest of the booklet includes coverage of the four scenarios, drawings of the weapons, notes, and detailed information on kill probabilities, terrain symbols and costs, and a brief summation of the menu options.



Battle Group: ***for veteran war gamers.***
READER SERVICE NO. 298

The program executes orders swiftly and is almost as quick when it comes to running the combat results and reporting them. This is true in both short, homemade scenarios and the complex historical ones.

Battle Group is a strategy gamer's delight. A tip of the helmet and a 21-gun salute to an outstanding military simulation.

Strategic Simulations, Inc., 883 Stierlin Road, Building A-200, Mountain View, CA 94043 (phone: 415-964-1353). *—Rick Teverbaugh*

THE GRAPHICS MAGICIAN JUNIOR

Polarware/Penguin Software
Commodore 64
Disk; $34.95

Closet Rembrandts and 10-thumbed daubers alike will cheer when they start using *The Graphics Magician Junior.* Its straightforward and uncomplicated design takes all the rigamarole out of computer graphics, so the artist can concentrate on the content of the picture.

The Graphics Magician Junior gives compu-artists a choice of input devices. The drawing cursor can be controlled by keyboard input (the i-j-k-m diamond), mouse, joystick, graphics tablet, or touch tablet. Whichever tool is used, the artist moves the cursor over the onscreen menu to select tools, colors, drawing mode, and brush point. The space bar toggles back and forth between the menu and drawing screens.

The program includes the usual batch of drawing modes. Line Mode helps the artist draw a perfect straight line between two points. Circle, box, and triangle modes complete geometric figures of any size automatically. Fill lets the artist flood any enclosed area with a color or pattern, and the draw option is for freehand composition. There's a large selection of brush points, including airbrushes and shaped points for executing special designs.

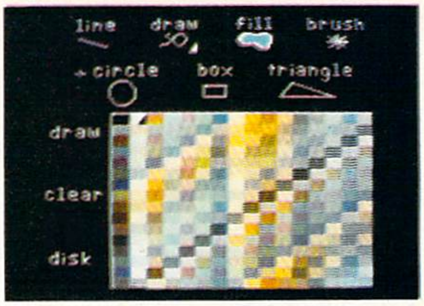
The Graphics Magician Junior offers two different magnification lenses for close and super-close detail work. This makes even the tiniest correction easy. In addition, a special zeroing-in technique helps reach hard to hit areas, so the artist can work more accurately in close spaces.

The color palette contains 256 shades. To draw, the artist merely moves the cursor over the desired hue, presses the button, and toggles to the drawing screen.

The Graphics Magician Junior isn't the most complex drawing program available. In fact, that is what makes it so desirable, especially for amateur users.

There's almost no documentation with the program. The authors feel that most novice computer artists dislike reading manuals. This may be true, but it's a cop-out, too. A well-written manual should be there for those who don't cringe at the sight of a printed page.

The few instructions included are on a poster. Unfortunately, the poster is unwieldy, since few home computer stations have adequate space to display it. However, since the instructions are so minimal, the poster will be quickly set aside anyhow.



Graphics Magician Jr: ***uncomplicated.***
READER SERVICE NO. 299

The Graphics Magician Junior designed by Mark Pelczarski and programmed by David Shapiro, is the little brother version of a more complex program now in use by many professional compu-artists: *The Graphics Magician Painter and Animator.* This version pares away the complications and subtracts the animation routines, yet retains the same high standard as the larger program. It might just be the best-ever graphics program for novice artists, thanks to its full range of features and ease of use.

Penguin Software, P.O. Box 311, Geneva, IL 60134 (phone: 312-232-1984). *—Joyce Worley*

THE CRIMSON CROWN

Penguin Software
Commodore 64
Disk; $34.95

Just when you thought it was safe to go back into the forest...

At the conclusion of Antonio Antiochia's illustrated adventure, *Transylvania,* the hero had vanquished and seemingly destroyed the dastardly Vampyr, rescued the beauteous Princess Sabrina, and restored Wallachia to normalcy.

Guess what? You can't keep a good vampire down. Antiochia's Vampyr is nothing if not a fine specimen of undeath.

The Crimson Crown is set a short time after the conclusion of *Transylvania*. Good King John has fallen mysteriously ill, and it seems the Vampyr is again casting his terrifying shadow over Wallachia. Next thing you know, the King is dead, the



Liberate the magical Crimson Crown *and destroy the bloodsucking Vampyr.*
READER SERVICE NO. 300

magical Crimson Crown is missing, and a wandering peasant reports an eyewitness confrontation with the Vampyr. When you respond to a desperate call for a hero, the intriguing sequel jumps into life.

There are underground chambers, a gryphon's lair, magical artifacts, and a host of characters, malevolent and benign.

The Crimson Crown represents an attempt at a more sophisticated type of adventure game than *Transylvania*. For one thing, the user has company on the quest this time. Princess Sabrina and Crown Prince Erik journey with you through the dark Transylvanian forests. The player can communicate with either of these companions by typing in simple verb-noun commands, preceded by the name of the party member being addressed (as in "Erik, take the ring"). Both Erik and Sabrina have special skills which make them invaluable on the quest, but it's up to the player to make the most of those talents.

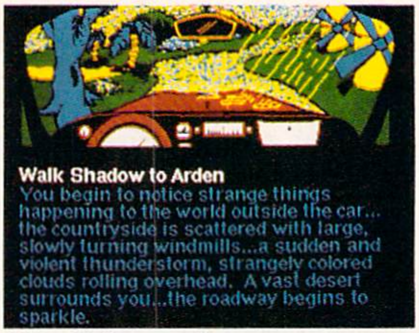
As the would-be saviors of Wallachia, the player and his royal friends must go to Karel Thurk, the ominously named stronghold of the dread Vampyr. There they must liberate the Crimson Crown and destroy the bloodsucker before he can master the crown's magical properties.

This does not, however, finish the adventure. The trio must return to Wallachia, where the court has become a rats' nest of intrigue and traitors. As with *Transylvania,* Antiochia's distinctive full-color illustrations are this game's most striking feature. This time out, he has abandoned the more traditional art style of the original in favor of a more lurid, almost electrified look. Everything—the trees, the mist, the tangled vines—glows as if limned in supernatural neon. Even the personal confrontations have a different look to them, as Antiochia presents characters not only in medium long shots but in extreme closeups, such as one illustration which depicts only the vampire's glowing red eyes.

The game's sole weakness is the plot's overreliance on puzzles. Users not enamored of the "I-am-old-but-I-am-new; I-have-no-color-yet-I-am-blue" school of adventuring will find *The Crimson Crown* tough sledding. Not only is the program riddled with riddles, but the packaging includes loads of additional ones.

That said, *The Crimson Crown* is a marvelous entertainment, full of plot twists and embellished with vivid, exciting illustrations. Antiochia is clearly one of the most gifted of game designers.

Penguin Software, 830 Fourth Avenue, P.O. Box 311, Geneva, IL 60134 (phone: 312-232-1984).



Nine Princes *offers more freedom of action than older Telarium titles.*
READER SERVICE NO. 101

NINE PRINCES IN AMBER
Telarium
Commodore 64
Disk; $32.95

It's a long road from a musty hospital room on earth to the glittering throne of Amber, the one true city. Obstacles both ordinary and distinctly supernatural stand between the hero of this illustrated adventure and his ultimate destiny.

Based on the first two volumes of Roger Zelazny's award-winning science-fiction saga, *Nine Princes in Amber* lets the computerist step into the nimble boots of Corwin. This prince of the royal blood regains consciousness with his legs in casts and an orderly advancing upon him with a dope-filled hypodermic. He must unravel the secrets of his own identity, find his way through the shadow realms to Amber, and contest with friendly and hostile siblings with schemes of their own in motion.

The major elements of the novels are much in evidence in the adventure game as well. Thus the player will eventually manipulate the magical trumps which make communication or even actual travel possible, walk through Shadow, brave the One True Pattern of Amber to gain even greater powers, and cross fencing swords with other Amberites.

Interaction with non-player characters is the main event in *Nine Princes in Amber.* The royal brothers and sisters all have strong personalities, and an approach which wins the loyalty of Bleys may draw only a deri-

sive laugh from Eric. It is as important to correctly divine the intentions of the other members of the ruling family as it is to unravel ordinary problems such as how to escape from the hospital.

The excellent, stylized illustrations occupy one third to one half of the screen. When Corwin communicates ith another Amberite, his or her trump fills much of the display. The drawings of rooms and other locations are reasonably detailed, though the "fill time" is somewhat slow, even for the C-64.

Unlike most computer adventures, *Nine Princes in Amber* makes extensive use of the Commodore's sonic capabilities. Musical themes periodically enliven the scenes. Those who prefer to struggle in silence can turn off the audio with a simple command.

The construction and pacing of the adventure may startle those conditioned to a more detail-oriented approach. The design team is less concerned with the mechanics of opening and closing doors, taking public transportation, and other such trivia than with the overall effect. If you want to go somewhere, expressing the intention is generally enough to immediately transport Corwin to the desired destination.

This moves the game along much faster than programs which force the player to direct the character step by step through the world. Despite the fact that this prose style seems to take a lot of the hero's minor actions for granted, *Nine Princes in Amber* offers the adventurer more freedom of action than most of the older Telarium titles. As is noted in the rules, there are many roads which lead to Amber.

Computer fantasy epics too often present just one more variation on the overused "save the princess" or "find the magical treasure" plotlines. *Nine Princes in Amber* is a game which breaks away from this formula to offer an enticing blend of palace intrigue, hand-to-hand combat, and world-spanning adventure.

Telarium, One Kendall Square, Cambridge, MA 02139 (phone: 617-494-1200). *—Arnie Katz*

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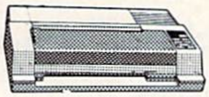
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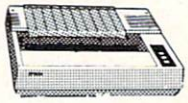
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HEART and SOUL of the AMIGA 1000 OPERATING SYSTEM

Complete with Dazzling Graphics and Other Wonders TO ASTOUND and BOGGLE THE MIND

It has been nearly nine months since we attended the unveiling of the Amiga 1000 at New York City's Lincoln Center. Although we were suitably impressed by its performance, it did not take us all this time to catch our collective breaths. We were awaiting a suitably auspicious occasion to present our traditional dissection of new computer technology.

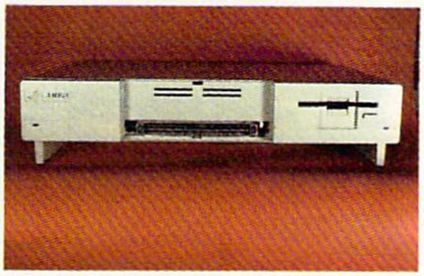
The moment has arrived, along with our long-delayed loaner machine from the Big C in the heart of West Chester, PA. The occasion? Commodore's announcement just 10 days after the ides of March that the Amiga will be sold for a mere $795, provided the 1080 color monitor is purchased with it at the $495 list price. This represents a $500 price cut! Although this was presented as a temporary price reduction, it has been our experience that these special offers have a way of becoming permanent.

In our opinion, this event is a precursor of things to come. Commodore, in its traditional role, is preparing to bring even more computational power to the people for even less bucks than ever before. We expect that by the time this report sees print you will know the truth far better than we do now.

THE SYSTEM

With its detached keyboard, the Amiga is a fundamental departure from Commodore's traditional single-piece machines. The bulk of the hardware has been placed in a separate





Amiga keyboard (top) and CPU front view, showing the RAM expansion port. Keyboard slides into receptacle below.
READER SERVICE NO. 105

box or central processing unit (CPU). The keyboard, the prime user interface, is tethered to the main machine via a coiled telephone cable. In a pinch, a standard telephone modular handset cord can be used. Just don't get any visions of operating the machine from across the room at the end of a 25-foot coiled cord. We tried it and it won't work. In any event, the Amiga's operating system is disk-intensive. A comfortable place in close proximity to the machine is mandatory for satisfying the voracious demands of its built-in disk drive.

The basic system includes 256 kilobytes of user RAM and an 880-kilobyte double-sided, double-density, 3.5-inch single disk drive, the keyboard, and a mouse. For the uninitiated, the mouse resembles an inverted miniature trackball with two buttons on top. Its motion across a flat surface is sensed by the computer in a manner not unlike a joystick.

All the hardware, except for the keyboard and the mouse, is contained in the CPU cabinet. A built-in switching power supply converts the high voltage alternating current supply to the low voltage 5 and 12 volt direct current required by the Amiga's peripherals and digital circuitry. The power supply keeps its cool with the help of a .00179 horsepower whisper fan at the rear left corner of the CPU.

We found the fan noise to be insignificant. However, both the internal and external disk drives emitted a periodic clicking noise till they were properly fed. The disk drives have the ability to keep the Amiga informed regarding the presence or absence of a disk.

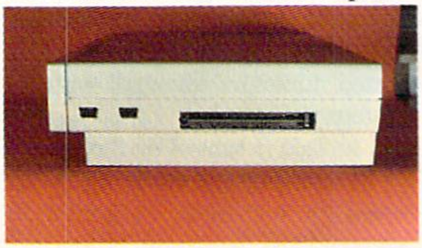
The built-in power supply has sufficient capacity to handle all of the Amiga's internal needs, including the keyboard, the mouse, and one external disk drive. Additional external drives will require an external power supply. We expect this will also be true for a multislot expansion chassis.

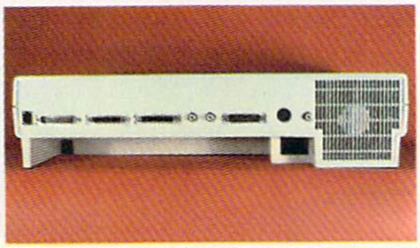
Most of the Amiga's expansion ports also offer some of the system's 5 volt and 12 volt DC voltages. The Amiga's introductory manual defines the specifics for each port, including the current limits at each supply point.

The basic CPU is actually equip-

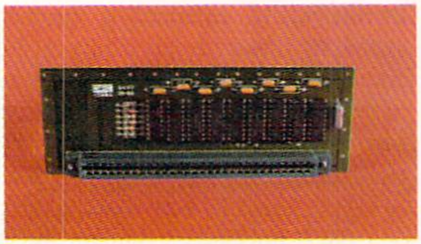
BY MORTON KEVELSON

ped with a half a megabyte of RAM. In addition to the 256 kilobytes of user RAM there is a hidden quarter megabyte of writeable control store (WCS). The WCS is where the Amiga's operating system goes when it is booted from the disk. This was originally intended to be replaced by 190 kilobytes of ROM in the final production versions of the machine. Apparently Commodore found the evolution of the Amiga's operating system to be an ongoing process and opted to leave it in RAM for the foreseeable future. This allows for operat-









ing system upgrades to be easily distributed on disk to the end users. To date the upgrade process seems to have been working very well.

The remainder of the onboard memory consists of 64 kilobytes of ROM, which contains the autoboot code. The autoboot program is responsible for getting the Amiga up and running. Unlike nearly all of Commodore's previous machines, the Amiga has to be fed its operating system shortly after power-up. Until it has been presented with its allotted dose of disks the Amiga is not much good for anything.

STARTING IT UP

Approximately 17 seconds after power on the Amiga hand appears, clutching the desired disk–in this case the *Kickstart.* Violence is not called for; merely insert the disk into the internal drive. 22 seconds later the Amiga is back asking for another handout. This time it's the main course, or *Workbench*, which is being called for. 20 seconds later *Workbench*, the Amiga's mouse-driven, icon-based operating system, is ready for use. In the process the amiga has gobbled up more than 300 kilobytes of data in under 45 seconds.

The two-disk startup sequence is somewhat less convenient than a single disk would have been. The advantage of this approach is software flexibility. The basic operating system routines are contained on the *Kickstart* disk. These routines are the Amiga Kernal, which will form a common base for all software developers. All the *Kickstart* code goes into the WCS. This is done only once during an Amiga operating session as long as the power is not turned off. The *Workbench* disk may be customized for a specific application. The overall arrangement provides for considerable operating flexibility.

The Amiga's operating system did crash occasionally. This was almost always due to attempts at stuffing more program into the machine than there was available RAM. It is the user's and the programmer's responsibility to make sure there is sufficient memory for incoming programs. If this is not properly done a new program can overwrite an existing one. Since the Amiga is a multitasking machine (that is, it can run several programs at once), the results can be disastrous.

When the system crashes one of two things may happen. Most often the screen goes black with a red message on top. The user is informed of a "Guru Meditation Error" along with a complex number which supposedly defines the state of the machine. At this point, transfer control to a remote terminal hooked up to the serial port by pressing the right mouse button. The left mouse button reboots the *Workbench* disk. On occasion the machine seemed to just go away. When this happened the *Workbench* could always be rebooted by a simultaneous depression of the Control key and the two Amiga keys. In either case it was never necessary to reboot *Kickstart.*

The basic Amiga, out of its box, is not enough to get you started. You will need a display device, preferably

Clockwise from top left: (1) Side view of CPU showing mouse/joystick ports and 86-pin pc edge card expansion port. (2) Back view showing ports from left to right, power socket below Composite video, and cooling fan to the right. (3) Keyboard with cover removed. 6500/1 microprocessor is centered above DEL key, 3 megahertz clock crystal is above f9 key, and modular telephone connector is above f3 key. (4) 256K RAM expansion module which fits in the front expansion port.

an analog RGB monitor, although any NTSC monitor or television can be used. The Amiga provides nearly any conceivable video signal, in standard NTSC format, at its rear panel ports. These include digital and analog RGB with all necessary sync signals on a 23-pin D connector, composite video with full stereo sound on an 8-pin DIN connector for the optional RF modulator, and separate video and audio signals on standard RCA-type jacks.

If you do not have an RGB monitor the Amiga will be limited to displaying its low-resolution modes. Television users will have to supply their own RF modulator if the set is not equipped with a direct video input. The video input on a VCR may be used for this purpose. Otherwise, be prepared to pay another $50 for the Amiga 3406 RF modulator.

At this point you will have an operable system, although you will rapidly discover some of the limitations of 256K RAM and a single disk drive on the multitasking, graphic-intensive

Amiga. The first of these is the inadequacy of a mere 256 kilobytes of user RAM for all but the most basic applications software. Most packages we have seen are just not comfortable with less than a half a megabyte to play with. For example, Electronic Art's *Deluxe Paint* cannot work with high-resolution graphics without the extra memory. Additional disk swapping is also required, as the entire program and graphic data cannot fit in a quarter megabyte.

The first Amiga peripheral we expect you will buy will be the 256 kilobyte internal memory expansion card. This plugs onto an edge card connector hidden beneath a plastic cover at the front of the CPU, bringing the internal user RAM up to half megabyte. The internal RAM is significant in that it is the only RAM which the Amiga's custom graphics chips can directly access. The importance of this will become apparent shortly.

Although you can get along without it, the experienced user will soon recognize the benefits of a second disk drive. The Amiga operating system is disk-intensive. Most Amiga applications leave many of their subroutines or commands on disk. The Amiga DOS itself keeps all of its commands on disk, loading them in as needed, every time they are called. Although it is possible to assign a portion of memory as RAM disk and place the most frequently used DOS commands in there, you will still find yourself swapping disks with annoying frequency. Thus we feel that the number two Amiga peripheral will be a second disk drive.

THE DISK DRIVES

The Amiga has adopted the new 3.5 inch floppy disk format. After working with these miniature floppies for several weeks, we have found much to say in their favor. These disks are encased in rigid plastic shells which create a uniform, protected environment for the fragile flexible media. This permits a higher degree of data density than is possible with the older 5.25 inch format. The plastic case of each disk includes an integral metal shutter which protects the disk when it is out of the drive. Each disk also has a built-in sliding write protect tab. The write protect disables writing to the disk when the slot is uncovered. This is the opposite of the convention used for the 5.25 inch format.

The Amiga's disk capacity is 880 kilobytes per double-sided, double-density disk. The disk is laid out with 40 tracks per side, 22 sectors per track, and 512 bytes per sector. Disk operations are comfortably fast due to the drive's access to one of the Amiga's 25 direct memory access (dma) channels. This allows for the direct transfer of data between RAM and the drive without the need to pass through the microprocessor. An indication of the drive speed can be had by the minute and a half it takes to copy one of the 880 kilobyte disks. This works out to an overall data rate of 20 kilobytes per second, or 40 times faster than a 1541 and a C-64. The actual data rate is much faster than this when the operations of disk copying are taken into account. In addition to the data transfer, the copy process formats the destination disk. A significant part of the copy time also involves much head movement. We generally found that most of the time used by the disk drive was spent in searching through the directories and moving the read/write heads. The actual data transfer rates were extremely fast.

A second drive is readily hooked up to the 23-pin D connector parallel port at the back of the computer. The second drive, which is powered from the Amiga, includes the required cable. Additional drives will require a separate power supply. The external disk drive's cable, which is permanently attached to the drive, is annoyingly short. The external drive could only be positioned to the right of or above the CPU. The right side of the CPU is also where the joystick/mouse ports and the main expansion connector are located. We can foresee a conflict developing between future multislot expansion boards and the external disk drive.

Contention for the sacred territory to the right of the keyboard soon developed to significant proportions with our own Amiga operations. This area suffered from the conflicting requirements of the mouse, growing piles of disks, and the need to access the external drive. This congestion was somewhat relieved by placing the mouse to the left of the computer. Fortunately this reviewer is fundamentally left-handed. Although the mouse's tail was long enough, some minor conflicts did develop with the keyboard cable. The right-handed users in the neighborhood remained perturbed.

THE MEMORY MAP

The heart of the Amiga is a 68000 microprocessor. This chip has a 16-bit data port and a 24-bit address port. Internally the 68000 is a 32-bit microprocessor. That is, internal data transfers and logic operations can be performed 32 bits at a time. External data transfers are limited to 16 bits. The 68000's instruction set includes operations for 8-, 16- and 32-bit quantities. Thus the latter require two fetch or store operations on the data bus.

The Amiga's clock is driven by a 28.6363 MHz crystal controlled oscillator. This is divided down to 14.31815 MHz, at which speed the system RAM and custom graphic chips operate. The clock is further divided to 7.159075 MHz, at which speed the 68000 microprocessor operates. These dual operating speeds for RAM and the CPU are responsible for a large part of the Amiga's capabilities.

The custom graphics coprocessor normally needs to access the data bus only on alternate clock cycles. This means that both the 68000 and the graphics coprocessor get full access to the data bus with little or no conflict. Thus the 68000 can run at full speed while the complex graphic operations may still take place. This freeing up of the 68000 is to a large extent what gives the Amiga its multitasking capabilities. Unlike the other 68000-based machines (the Macintosh and the Atari ST), the Amiga's 68000 spends very little of its time handling the display graphics. We will take a much closer look at the Amiga's multitasking operating sys-

tem next month.

The 24-bit address port gives the 68000 a direct address range of 2^{24} bytes. This translates to a total address space of 16 megabytes. The memory map on page 58 shows just how this address space is apportioned in the Amiga. A close look at this map will be instructive.

When examining the memory map you will note that six hexadecimal digits, two more than for the C-64, are required to represent an Amiga address. This accounts for the additional eight bits of the 68000's address bus (24 for the 68000 versus 16 for the 6502). The two new hexadecimal columns are the 65536 and 1048576 columns respectively.

Starting at address $000000, the first half megabyte is occupied by the system's internal RAM and the internal RAM expander card. This is the only RAM which can be directly accessed by the Amiga's custom graphics chips. This restriction is significant in that it determines to a large extent just how Amiga programs should be written to support maximum graphic flexibility. For best results program code should be designed to automatically relocate itself to external RAM whenever it is available.

At this point you will notice a 1½ megabyte restricted gap in the memory map. We speculate that this reserved space is for future expansion of the internal RAM in the next generation of the Amiga. This will give future machines much greater graphic capabilities.

As we go through this map we will be speculating on the possible uses of the various reserved space in future generation machines. This in no way implies that we feel that Commodore intends to create and market a more advanced machine at any time in the future. The true significance of these speculations is to emphasize the open-endedness of the basic Amiga design. These gaps will help insure that future versions of the machine will remain upwardly compatible with the present incarnation.

The next eight megabytes of address space is reserved for the external RAM expansion. A fully expanded Amiga may be equipped with up to 8½ megabytes of user RAM plus another quarter megabyte of WCS.

The next two megabytes of address space is vacant with the exception of the last 64 kilobytes. A pair of 8520 I/O chips are mapped into the latter range. These chips are functionally identical to the 6526 Complex Interface Adaptors (CIA chips) used in the C-64. Each chip is equipped with two 8-bit bidirectional data ports, a pair of 16-bit timers, an 8-bit serial port, and two interrupt control registers. The large empty space in this 64K slot is probably for current as well as future I/O expansion.

The accompanying chart shows the addressing of the two 8520's. You will note that the chip addresses fall on 256 byte page boundaries. Also note that chip "A" is accessed only on odd addresses while chip "B" occupies the even address slots.

8520 I/O Chip Memory Map

8520-A	8520-B	Description
BFE001	BFD000	Peripheral Data Reg. A
BFE101	BFD100	Peripheral Data Reg. B
BFE201	BFD200	Data Direction Reg. A
BFE301	BFD300	Data Direction Reg. B
BFE401	BFD400	Timer A Low Reg.
BFE501	BFD500	Timer A High Reg.
BFE601	BFD600	Timer B Low Reg.
BFE701	BFD700	Timer B High Reg.
BFE801	BFD800	Event LSB
BFE901	BFD900	Event bit 8-15
BFEA01	BFDA00	Event MSB
BFEB01	BFDB00	Not Used
BFEC01	BFDC00	Serial Data Reg.
BFED01	BFDD00	Interrupt Control Reg.
BFEE01	BFDE00	Control Reg. A
BFEF01	BFDF00	Control Reg. B

We next encounter a two megabyte slot of which all but the last four kilobytes are reserved for future use. The Amiga's custom graphic chips are to be found in this last 4K. Could the gap at this point in the map signify an even more ambitious custom chip project? We hesitate to speculate any further on this topic. The actual address space occupied by the custom chips is about 512 bytes. The chip registers are interleaved through this space, which gives some indication of the unary nature of the three custom chips. These chips are actually components of a single large chip. The overall design was too complex to be economically implemented on a single piece of silicon at this time.

The first half of the next megabyte is reserved for future use. The second half is used for the expansion slot decoding. Once again we speculate that the intention is for even greater external expandability of future machines. The expansion space allows for 128 slots of four kilobytes each. These slots may be occupied by boxes or boards where boxes may contain additional boards. Boxes or boards which require four kilobytes or less will be mapped directly into this available space. Boards which need more than the available four kilobytes will also be mapped into the eight megabyte external expansion space.

Commodore has specified the expansion box and board configuration in great detail. Box and board auto-identification has been specifically designed to prevent conflicts among various products. There is even a two byte manufacturer's code contained in the specification.

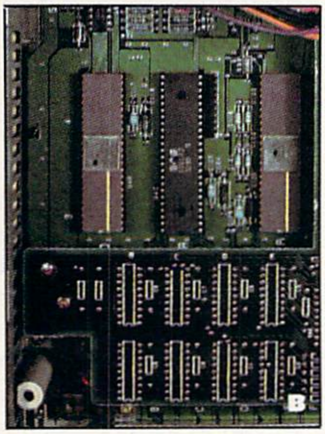
The last megabyte was intended for the system's ROM. Once again we find the first half megabyte reserved for future use. The Amiga's present operating system resides in the last half megabyte of its address space. The exact configuration will vary. We do not know the precise arrangement of the WCS, as the available documentation only refers to the original ROM configuration. We do speculate that the WCS occupies the quarter megabyte slot starting at $F80000. The system's boot ROMs are located in the last 64 kilobytes of memory.

AMIGA GRAPHICS—IS IT REAL OR IS IT AMIGA?

We have saved the best for last. The Amiga's amazing graphics is what will probably attract many users to the machine. Without a doubt the Amiga's graphics capabilities exceed that of any other machine on the market within its price range. First there is color—lots of it. A total of 4096 hues can be generated by the machine. The colors are specified by a 12-bit word with 4 bits used for each of the Amiga's three primary colors (red, green, blue). Some of the Amiga's competitors have derided the

need for so many shades. To those we need only present some of the digitized images which grace this report. A refined color scale such as the Amiga's can generate images with realism unprecedented in a personal computer.

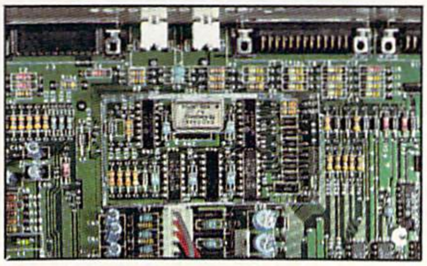
The Amiga has four basic graphic modes. The low and high resolution modes can display 320 and 640 horizontal pixels respectively. Each mode may also be non-interlaced or interlaced, which results in a corresponding vertical resolution of 200 and 400 lines. Thus an Amiga image can range from 64,000 dots in a 320 x 200 grid to 256,000 dots in a 640 x 400 grid. By comparison the Amiga's minimum resolution represents the best that the Commodore 64 can do – and we all know that the C-64 has the best home computer graphics on the market.

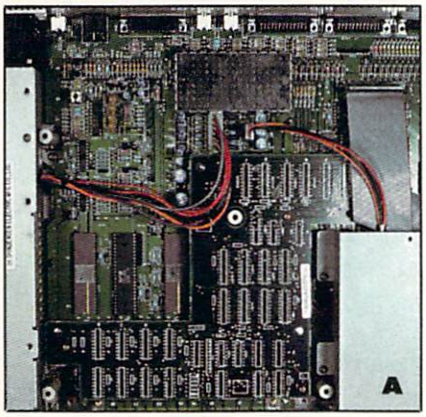


The color which is available for these display formats is impressive. The low resolution screen can display any pixel in any one of 32 colors. These 32 colors, which are common for the entire screen, are selected from the entire palette of 4096 colors. Actually, the latest Amigas can display 64 colors on the screen using a newly added half brightness mode on the graphics chip. The high resolution display is limited to a palette of 16 colors selected from the available 4096.

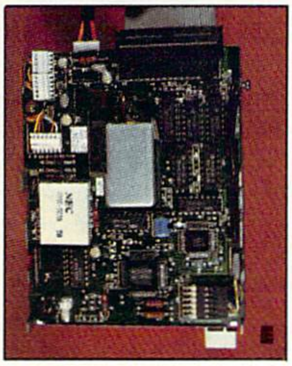
By comparison the C-64 is limited to only 16 colors, period. Furthermore, although the C-64 can display all 16 colors on the high resolution screen, only two colors may be used in an 8 x 8 pixel cell. This is extremely limiting in comparison to the Amiga.

In terms of memory the Amiga's graphics do not come cheap. This is not unusual. The highest memory overhead on any microcomputer is usually the bit map graphics. It is no idle expression that computer pictures are worth thousands of words. To achieve this colorful display the Amiga uses bit plane graphics. A single plane, or layer of pixels, can define a monochrome image. The resolution of the image corresponds to the size of the plane and the memory used. Thus a monochrome, low resolution image requires 320 x 200 dots, which corresponds to a block of memory 40 bytes wide and 200 rows high for a









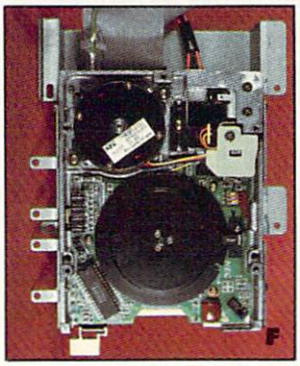


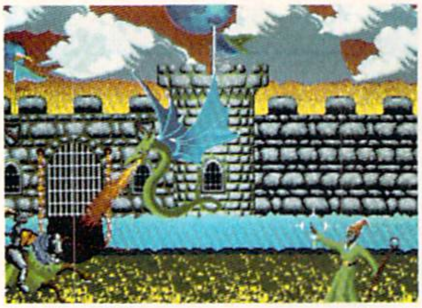
PHOTO A: The Amiga's main chassis. Power supply is on left side (silver rectangle). Cooling fan is above power supply (black box). The circuit board which contains the 256K RAM Writeable Control Store (WCS) is attached to main circuit board (the backward-facing L-shaped board that occupies the bottom central part of board). The internal disk drive is in the lower right hand corner.

PHOTO B: Closeup of custom graphics, sound, and coprocessor chips. Position of the eight 256 kilobit dynamic RAM chips which constitute the 256K WCS is seen at bottom. The Amiga's onboard 256K RAM is located below the WCS.

PHOTO C: Closeup of the Amiga's clock circuit (with metal shield cover removed) and video circuitry. The 28.6363 crystal is clearly visible.

PHOTO D: Section of circuit board hidden directly below disk drive in Photo A. From the top are a pair of 8520 I/O chips and the 68000 microprocessor (large black rectangle to the right of the 8520s). Two ROM chips contain the 64K of autoboot code. Clearly visible are the marked positions for the 192K of the Amiga operating system. These ROMs have been replaced by the 256K WCS.

PHOTOS E AND F: Top and bottom views of the Amiga's 3.5" disk drive.







As the slide at the extreme left indicates, even Morton the K can become an artist with the help of Electronic Arts' **Deluxe Paint** *and its sophisticated brush facility which lets you use any part of the image as a brush to*

total of 8,000 bytes.

Adding a second bit plane does not change the resolution of the resulting image. Instead a pair of bits in the two layers can now be used to select from four colors for each pixel. To get 32 colors we need five bit planes or a total of 40,000 bytes of data. Interlacing doubles the memory requirements to 80,000 bytes for a full color low resolution image. This does give us the ability to display an image which is 320 dots wide and 400 dots high in 32 colors.

High resolution doubles the memory requirements once again. In this case, since we are limited to only 16 colors, four bit planes are sufficient. The memory requirements of an interlaced high resolution color display are 128000 bytes. This much memory represents an image which is 640 dots wide by 400 dots high with up to 16 colors.

The requirements of the graphics display serve to emphasize the limitations of the Amiga's basic 256K RAM when it comes to graphic applications. A program such as *Deluxe Paint* from Electronic Arts maintains two complete images in RAM at one time. The program has additional overhead for brushes and the OOPS feature. Thus in high resolution mode, the Amiga's entire quarter megabyte would be required just for the working images, leaving no room at all for the actual program.

We have mentioned interlace on several occasions. This refers to the way a video image is constructed. A standard NTSC image frame is built up of 525 lines. Images are displayed at a rate of 30 frames per second. Each frame is actually composed of two half frames of 262½ lines apiece. In the ideal case the lines of the second half frame would be drawn in the gaps left between the lines of the first. This approach, similar to the weaving of cloth, is what we refer to as interlace. Thus it takes two passes at 1/60 of a second to create a single video image.

System Memory Map

Address Range	Description	Amount
000000-03FFFF	Built-in RAM	256K
040000-07FFFF	Internal Expansion RAM	256K
080000-1FFFFF	Reserved	1.5M
200000-9FFFFF	External Expansion RAM	8M
A00000-BEFFFF	Reserved	2M less 64K
BFD000-BFDF00	8520-B (Even addresses)	4K in 64K slot
BFE001-BFEF01	8520-A (Odd addresses)	4K in 64K slot
C00000-DFEFFF	Reserved	2M less 4K
DFF000-DFFFFF	Amiga's Three Custom Chips	4K
E00000-E7FFFF	Reserved	512K
E80000-EFFFFF	Expansion Slot Decoding	512K
F00000-F7FFFF	Reserved	512K
F80000-FFFFFF	System ROM and WCS	512K
	Total	16 Megabytes

In practice most video displays do not have the resolution to interlace the image. Thus the second frame overlaps the lines drawn by the first. The Amiga and its 1080 monitor can display an interlaced image. Although the display is clearly defined, there is a noticeable flicker of the image in interlaced mode. This is a consequence of the high speed phosphors used on the 1080 monitor. By the time the second frame comes around, the image of the first frame has faded from view. The 60 Hertz refresh rate is too fast to allow the eye to retain a strong afterimage, hence the apparent flicker (a Hertz is equal to one vibration per second).

It is possible to resolve the problem by using longer duration phosphors, that is, phosphors which continue to glow for a longer period of time. The disadvantage of this approach is the resulting streaking caused by movement of objects in the image. We have heard of some non-Commodore monitors which offer a good compromise for both problems. However, we have not had the opportunity to work with them at this time.

THE KEYBOARD

The Amiga's keyboard has a good feel to it, with all the expected keys in the right places. These include a set of 10 function keys along the top, a pair of large, comfortably located shift keys, and a clearly labeled oversized return key. A separate cluster of four arrow keys facilitate cursor movement. A 13-key numeric keypad will gladden the hearts of accountant types, even if it is missing three of the four basic mathematical operators. There is even a light emitting





paint with. At the extreme right is **Light Tower,** *a lo-res* **Deluxe Paint** *image by John Song of The Bronx, NY. Sandwiched in between are various graphic images currently floating in the public domain—authors unknown.*

diode (LED) embedded in the CAPS LOCK key to alert the user when it is down. A pair of flip-up feet elevate the keyboard to a comfortable angle. The whole thing stows in a compartment under the CPU when not in use.

The real power of the keyboard lies under the hood. It has its own 6500/1 microprocessor with two kilobytes of ROM, 64 bytes of RAM, and four I/O ports with eight bits each. The microprocessor runs at 1.5 megahertz off an onboard 3 megahertz crystal oscillator. This sophisticated hardware makes the keyboard a small computer in its own right. The keyboard has the ability to distinguish between the up and down strokes of a keypress.

As we mentioned above, the keyboard is linked to the CPU via a four conductor coiled cable which may be replaced by a common telephone handset cord. Two of these conducters carry the five volt dc power and its ground return from the CPU. A third conducter provides for synchronization by linking the keyboard clock to the CPU. The remaining wire carries the actual keypress data. Data transmission consists of a serial stream of 8 bit data words. The transmission rate is about 17,000 bits per second, well over 2,000 characters per second, which should be fast enough for the most skillful typist.

In all there are a total of 91 keys on the Amiga's keyboard. Seven of these perform special functions and have dedicated input lines on one of the microprocessor's ports. These are the CTRL key, the left and right SHIFT keys, and the two AMIGA



A low-res image generated by the Electronic Arts' **Kaleidoscope** *demo program, included with the Amiga, which generates endless displays of this sort.*



Gosh, it makes a body proud to live in a country that can produce a computer like the Amiga.

keys. The AMIGA keys are the ones with the stylized A's which flank the space bar. Any resemblance between the AMIGA keys and a popular fruit are purely coincidental and solely in the mind of the author.

The remaining 84 keys are part of a matrix which is 6 rows high and 15 columns wide. A simple mathematical calculation will show that there are six vacant slots in the keyboard matrix. The four I/O ports on the keyboard microprocessor actually support 16 columns in the matrix, which allows for the possibility of up to 12 more keys on future keyboards.

The keyboard is designed to handle a variety of data transmission disasters. It is even possible to plug in the keyboard after the Amiga has powered up with no ill effects. When the keyboard is initialized it performs several self tests. Failure of any test will be indicated by a flashing of the CAPS LOCK LED. The flashes are coded in bursts, of one to four blinks, at one second intervals. The number of blinks pinpoints the trouble spot. A single blink per second signifies a keyboard ROM checksum failure. Paired blinks indicate a power-up RAM test problem. Triple blinks designate problems with the keyboard's timer. A blinking quartet warns of a short between two keyboard row lines or the seven special keys. The last test may not be implemented in early releases of the keyboard.

A hardware reset is built into the keyboard. This is triggered by the simultaneous depression of the CTRL key and the two AMIGA keys. Within one half second of the release of any of these three keys, the Amiga will reset to the *Workbench* disk request. The *Kickstart* code in the WCS remains intact.

CONCLUSION

This is really an interruption rather than conclusion. Our venerable editor is pacing the floor mumbling something about color deadlines and advertising pages. The typesetter is casting restless glances at the door and clock. In the interest of maintaining harmony among our staff we will postpone the remainder of our Amiga presentation until the next issue. At that time you will be treated to details of the Amiga's custom graphics chips, an indepth discussion of the operating system and *AmigaBASIC*, some software treats you will find in your Amiga package, mention of as much Amiga software as space allows, and some more incredible graphics from this amazing machine.

We would like to acknowledge the support of the New York Amiga User Group (AMUSE) in the production of this report, in particular for allowing us to ravish their public domain library for some of the outstanding graphics which lavish these pages. Information about AMUSE may be obtained by calling 212-473-5495. ☐

CRAZY JOE

For the C-64

By Chris Greacen

Riding a motorcycle extremely fast on a six-lane interstate highway is not everyone's idea of fun, but then not everyone is Crazy Joe. First let it be said that by normal standards, Crazy Joe is not quite right upstairs. In fact by any standards, Crazy Joe lives up to his name. A bystander would say he is suicidal, and this may be true, judging from his love of riding his motorcycle. Why is this crazy? Crazy Joe's motorcycle has no brakes, and furthermore, its idling speed is faster than many cars on the street. Now just for the moment put yourself in his shoes. Would you like to hit a car when you are going 90+ miles an hour? Neither would he, so as you play the game, weaving Joe in and out of traffic, be careful, because his life is at stake.

THE PLAY

The object of *Crazy Joe* is to allow Joe to enjoy life as long as possible. This is accomplished by keeping Joe on the road, and avoiding collisions with cars. Use a joystick in Port 2 to move Joe left and right. The fire button serves as an accelerator. If you do not have a joystick, the CONTROL-D and CONTROL-G combinations will move Joe left and right respectively. Use CONTROL-J in order to accelerate.

TYPING IT IN

Crazy Joe is written in BASIC, although part of it is in machine language (in the form of DATA statements). Type it in and save a copy. To play the game, load it and type RUN. The screen will turn black, and you should see some choices regarding the level of play. Try "EASY" (fl) to get a hang of how the game works. If at any time you want to change levels, just hit the space bar, and you will be returned to the first screen. Good luck, and long live Crazy Joe! □

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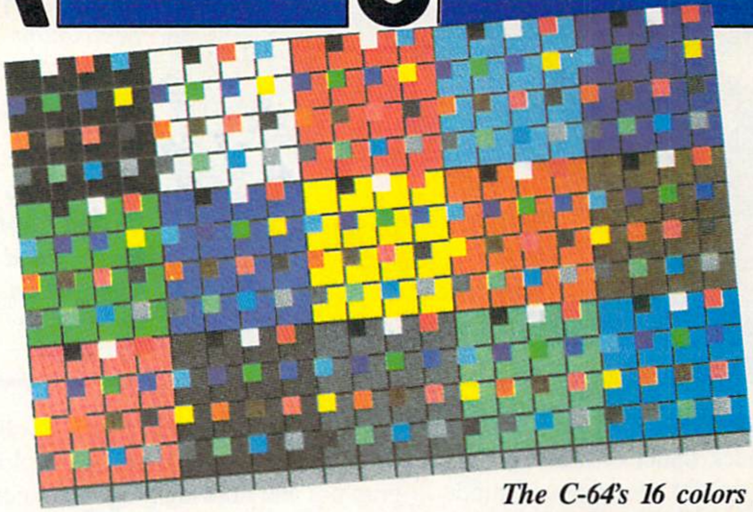
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Reader Service No. 132

PJ-1080A COLOR INKJET PRINTER

Canon, Inc. (see below)
Price: $399.00

Color printers are few and far between. Even fewer and farther between are color printers in a price range commensurate with the C-64 and C-128 computers. The PJ-1080A color printer, by Canon Inc., lists for $699. An apparently identical unit is listed in the Radio Shack catalog as their model CGP 220 for $599. The printer has apparently penetrated the "gray" market at substantially lower prices. We obtained ours from Progressive Peripherals & Software with custom software for both the C-64 and Amiga.



The C-64's 16 colors in most of the 256 possible combinations, courtesy of Wayne Schmidt and the PJ-1080A. *READER SERVICE NO. 104*

We first saw this printer in action at last December's World of Commodore Convention in Toronto. After having the opportunity to work with the machine, we remain impressed with its performance. Although it is not the ideal printer for all applications, it may be just what many of you are looking for.

The inkjet print mechanism is radically different from the common impact type dot matrix printer. Although characters are built up from miniscule dots, the ink-to-paper-transfer technology is uniquely different for this type of machine. Microscopic ink droplets are literally squirted onto the paper as the printhead passes by. Since there is no direct mechanical contact in the ink transfer process, inkjet printers generate minimal noise while in operation.

The Text

Although text quality is good, with clearly defined characters, we would not recommend the PJ-1080A for this purpose. Printing speed is less than 40 characters per second. Lower case descenders are lacking. Most advanced text features, such as super and subscripts, are missing. As we see it, text is just not this printer's forte.

Bit Map Graphic Dumps

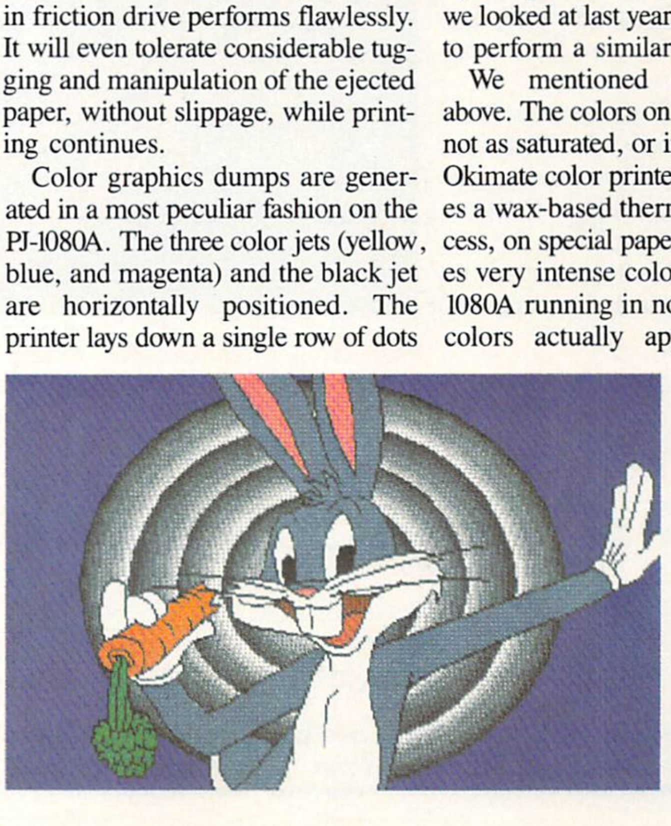
The printer excels in the production of computer bit map graphic dumps. It is the first printer we have seen that is completely free of the annoying horizontal lines (either gaps or overlaps) which afflict every other dot matrix printer we have come across. The resulting images are so uniform as to appear to have been generated by some photographic process.

This was surprising to say the least. The printer does not have a tractor or pin feed, nor is there any provision to add one. However, the built-in friction drive performs flawlessly. It will even tolerate considerable tugging and manipulation of the ejected paper, without slippage, while printing continues.

Color graphics dumps are generated in a most peculiar fashion on the PJ-1080A. The three color jets (yellow, blue, and magenta) and the black jet are horizontally positioned. The printer lays down a single row of dots with each pass of the printhead. Fortunately, the head moves very quickly. As a result it takes less than five minutes to generate a double density horizontal dump. A single density dump takes only about 3½ minutes. These times are for the printer being driven by the Amiga computer.

Graphic dumps with the C-64 are comparably quick. Even the most modest computers are able to drive most printers at their maximum speed. By comparison the Okimate 10, which we looked at last year, took 20 minutes to perform a similar dump.

We mentioned double density above. The colors on the PJ-1080A are not as saturated, or intense, as on the Okimate color printers. The latter uses a wax-based thermal transfer process, on special paper, which produces very intense colors. With the PJ-1080A running in normal mode, the colors actually appear somewhat



Color graphics dumps are generated via yellow, blue, and magenta jets. The printer lays down a row of dots with each pass of the printhead.



Frequent* Art Gallery *contributor Alberto Valsecchi of Milano, Italy rendered tabby on the C-64 and printed him out on the Canon PJ-1080A.

faded. A small slide switch, located on the back panel of the PJ-1080A, sets the printer to enhanced mode. This causes the printhead to make two passes over each row of dots. The result is much better color saturation.

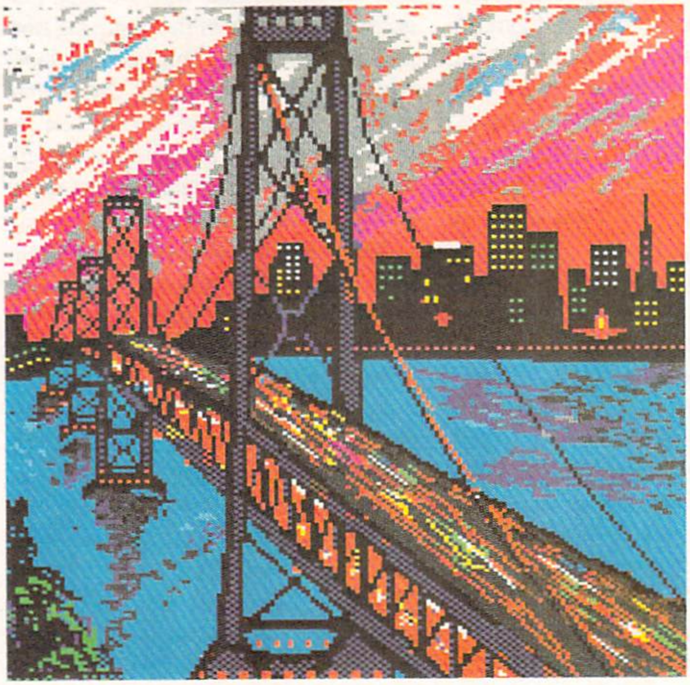
The Driver Software

Bit map graphic screen dumps require fairly sophisticated programs. Machine language is a virtual necessity in order to achieve operating speeds that match the printer's capabilities. In addition, the code is highly specific to both the host computer and the associated printer. A color graphic dump program is even more complex. The added burden of controlling the three primary colors, in addition to black, substantially increases the complexity of the screen dump code.

If you buy the PJ-1080A from Progressive Peripherals & Software (Phase 4 Distributors in Canada), you will have a choice of either C-64 or Amiga color driver software for the printer. The C-64 software, which is provided, actually includes two independent programs. The first is a full-featured, light pen-driven, multicolor graphics and drawing program which goes by the quaint title of *Picasso's Revenge.* This is actually the *Peripheral Vision* graphics package (see review in the November 1984 *Ahoy!*) from the now-defunct Futurehouse, Inc. The accompanying light pen even bears the Futurehouse logo.

According to Progressive Peripherals & Software, the light pen has been significantly improved, although it is externally identical to the original product. Scott Maxwell, author of Inkwell Systems' *Flexidraw* (see review in the June *Ahoy!*) and Progressive's resident software guru, has taken the program in hand. As a result the built-in printer driver is now compatible with the PJ-1080A printer.

The C-64 disk also includes a stand-alone *Color Cannon* printout utility. This program will produce a color dump from bit map files, in both multicolor and hi-res formats, created by virtually any C-64 graphics package. If your particular disk



Another C-64 dump by Alberto Valsecchi, this one previously seen as a screen photo in the January '86* Art Gallery. *PJ-1080A color dumps are free of the horizontal lines that afflict dot matrix printers.



Text quality is good in both normal (left) and enhanced modes, but the characters lack lower case descenders. Print speed is under 40 cps.

file format is not on the menu, and you know its bit map disk parameters, you can enter them into the program as well.

The *Color Cannon* print utility was easy to use by virtue of its menu-driven user interface. This included a built-in directory display for easy selection of single image files. The drawback of this approach is that it's limited to the selection and printing of one image at a time. This requires the constant attention of the user who wishes to dump several images in a

COLOR DUMP DIMENSIONS AND RATIOS FOR PJ-1080A

(Dimensions in Inches)		C-64			Amiga		
		Width	Height	Ratio	Width	Height	Ratio
Monitor Display	1902A	9-1/8	7-3/8	1.24	–	–	–
	1080A	–	–	–	10-3/8	7-1/8	1.46
Progressive Peripherals	Small	3-3/4	2-3/8	1.61	7-1/16	4-7/16	1.59
	Large	7-5/8	7-1/8	1.07	7-7/8	7	1.13
Billboard Maker		7-5/8	4-3/4	1.61	–	–	–

single sitting. We would have liked to have seen the inclusion of an autodump feature which would allow a group of images to be automatically sent to the printer. At the very least an automatic dump of a diskful of images would have been helpful.

If you are reasonably familiar with BASIC, you should be able to customize the *Cannon* print utility with minimal effort. The main program, which is written in BASIC, is well-structured into functional blocks. Additional guidance is provided by the liberal use of REM statements which identify the function of all the routines. The above mentioned modifications could thus be easily installed.

For the Amiga, Progressive Peripherals & Software provides a complete *Workbench* disk with the Canon PJ-1080A driver installed in the Amiga's *Preference* utility. It is contained with the Custom option on the *Preference's* printer menu. The disk is ready to go right out of the package. One word of caution: we found that the default screen colors as set up on the distribution disk matched the opening screen for Electronic Arts' popular *Deluxe Paint* graphics package. As a result the *Deluxe Paint* opening menu was invisible until we changed the Canon *Workbench's* default colors.

For both the C-64 and the Amiga, the user has a choice of two sizes for the color dumps. The following table compares the dump dimensions with the corresponding computer's screen display format. We have also included the width to height ratios for each image. A dump with a ratio which is greater than the screen format will print an image squatter than the original. A ratio which is less than the screen display will produce a stretched image.

On Color

The PJ-1080A can generate six colors plus black. The driver software does a good job of recreating the C-64's 16 colors. Shades, which are not directly available from the printer, are generated by dithering the available colors. The results are quite impressive.

The Amiga has a palette of 4096 possible display colors. The resulting printer colors are not up to this task. The results are nevertheless more than acceptable. The printed images were able to distinguish all but the very finest gradations of shade.

Concluding Comments

As we mentioned above, the Canon PJ-1080A appears to be identical to Radio Shack CGP 220 color ink-jet printer. We went to Radio Shack to purchase three 75 foot rolls of paper for the PJ-1080A. The Canon will accept single sheets or rolls of paper. The rolls are most convenient for graphic dumps. A single roll fits into a handy hopper on top of the printer.

The PJ-1080A ink supply is in two packs. The black pack contains 25 cc's of ink. The color pack contains three 20cc color ink packets. The former is rated at 4 million characters, the latter at 3.5 million characters per color. We estimate that this translates to over 400 small size double density dumps on the Amiga for a cost of only pennies per picture. The ink packs are $9.95 and $14.95 respectively at Radio Shack.

A final word is in order on the handling of inkjet printers. In brief, it is best not to. The printer will not suffer damage from normal handling. However, vigorous movement will introduce air into the nearly microscopically sized ink channels. This may take several hours to clear. We had to allow our PJ-1080A to rest comfortably overnight after the rigors of cross country shipping before it was usable.

Overall the PJ-1080A looks like a good performer. A Canon spokesperson has indicated that the printer is still in production, but not in quantity for the consumer market. As a result availability may be spotty as the current stocks are depleted. This should happen fairly rapidly at some of the prices we have seen.

The printer is available for $399 from Progressive Peripherals and Software. However, substantial user group discounts for bulk orders are available. PP and S backs the printer with their own 90 day warranty. A printer from the authorized importer carries a one year warranty from the manufacturer.

Canon USA, Inc., One Canon Plaza, Lake Success, NY 11042 (phone: 516-488-6700).

Progressive Peripherals & Software, 464 Kalamath Street, Denver, CO 80204 (phone: 303-825-4144).

In Canada: Phase 4 Distributors Inc., 7157 Fisher Road S.E., Alberta, Canada T2H 0W5 (phone: 403-252-0911). *–Morton Kevelson*

HOME INFORMATION MANAGEMENT SYSTEM

VMC Software
Commodore 64
Disk; $29.95

VMC Software's *Home Information Management System (HIMS)* is a combination of three database programs and two utilities. The three programs help you to maintain your checking account, keep an address book, and inventory your valuable property. The two utilities are a pop-up calendar and calculator.

Every feature is accessed from the *HIMS* main menu. The calendar and calculator are available at the main menu and at the three submenus, but not during data entry or review. Pressing f1 brings up a calendar for the current month; *HIMS* asks for the date when it loads. No other months are available to display.

Pressing f3 pops a calculator onto your screen. The calculator includes the four basic arithmetic functions. Results cannot be automatically inserted into the checkbook or other

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The publisher cannot assume responsibility for errors in the above listing.

database programs.

The home inventory program lets you record up to 100 items. For each item, you are asked for its name, category, description (two or three words), serial number, price, purchase date, and location. After you enter an item, the program will return you to the home inventory menu. To enter another item, you must choose the "enter" option again. When you sit down to enter dozens of items at once, this can get tedious.

Once your possessions are entered, you can search, sort, or print the list and edit or delete a record. You are not allowed to change an item name or its category; instead you must delete that record and reenter it. Sorts are always in ascending order (A to Z), on either the item name or location fields. You cannot, for example, sort by price or category.

Searches are also allowed only by name and location. A printed listing will give each item and then total the number of items and their original cost. No page breaks are included; the listing will go right across the perforations in your fanfold paper.

HIMS' address book has options similar to the home inventory program. It allows entry of 100 records. After choosing "enter" for each record, you are asked for last and first names, address, city, state, zip, area code, phone number, and extension. The name fields cannot be edited. Your sorts and searches can be by last name, city, state, zip, or area code.

Rather than a listing, the address book prints out mailing labels. Each has three lines–first initial and last name; address; and city, state, and zip. You can use only one-up labels, and not the kind that come three-across on regular width paper. If your printer does not have an adjustable tractor, this could be a problem.

When you choose the checkbook option from the main menu, you will be asked for a three-letter account name and the charge per check. For each account, you may enter up to 100 checks. As with the other programs, you have to choose "enter" for each record; there is no enter mode.

You must identify each entry as a check, credit, deposit, interest, or surcharge. After you enter a check's date, number, payee, amount, and purpose, you have the opportunity to verify the data as correct. Take the opportunity. The manual says to enter dollar amounts in the *###.##* format without a dollar sign. The checkbook program will accept, however, anything you enter, including the name of your pet snake. Needless to say, this makes for some interesting balances.

Once your account transactions are entered, you can search for a check or record number (assigned in the order you enter transactions). Or you can get a summary of transactions, including the total amount of checks, deposits, etc., and your account balance. A listing of transactions in the order you entered them can be sent to the screen or printer. A summary of transactions is included, but page breaks are not. You may not edit or sort your transactions, so your listing is liable to be significantly out of order.

There should be room on your data disk for 10 checkbook account files, along with an inventory and an address file. That's room for 1000 checks, but you will have no way to link account files together; each is a separate entity.

The manual of *HIMS* contains fewer than five pages of instructions on actually using the program. No examples are included, only short descriptions of each option. In the review copy, four paragraphs were placed at the top of page 7 that should have been at the top of page 8.

HIMS keeps all data in memory for each of its three programs. This makes sorts relatively fast, but it is probably the cause of the 100 record limit. Each time you enter or exit one of the programs an entire dta file must be loaded from or saved to disk.

I like this program for its ease of use, but before you buy make sure it's exactly what you need. You cannot modify the field names or lengths, increase the maximum number of records, change the listing format, or control the parameters of sorts.

VMC Software, P.O. Box 326, Cambria Heights, NY 11411 (phone: 718-527-5298). *–Richard Herring*

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NEBERGALL RUN

For the C-128

By Roger Browne and Steve Gebert

You were wondering why you, a mere lieutenant, would be placed in command of the newest supply ship in the fleet. That was the good news. Now the bad news—you will have to singlehandedly save the planet Nebergall from the forces of the Black Nebula!

Commission papers and communicator in hand, you sit down at the ship command terminal, and a message comes in. Your ship has been supplied with the newest (if most unreliable) laser the fleet has. It is also the only one! The forces of the Black Nebula are massing in the supply lanes in preparation for the invasion of Nebergall. You must get the supplies through, and destroy as many of the enemy troop ships as you can. If you don't, the following supply convoy will be destroyed, and so will you. As if that weren't enough, miss too many shots, and your laser overheats from reverse ionic flux, destroying your ship.

Your Mark-IV laser is operated through Control Port 2 on your computer console. To insure that you do not overuse your laser, you must depress and hold the fire button until discharge. Firing is tied into an onscreen targeting display; your lasers will also fire off the view screen. The display will keep track of the enemy troops destroyed during the mission. The enemy troop ships have advanced electronic detection systems, enabling them to avoid your laser with rapid course changes. It has been reported that some of the enemy ships shielding capabilities, thus requiring a direct hit.

Once you consider yourself an experienced mission commander, you may wish to select a higher level of difficulty. Level one is easiest. At lower levels of difficulty, you can miss more often, and have fewer troop ships to clear out. The faster moving ships are newer and carry more troops. Of course, they are harder to hit.

We are thoroughly enjoying programming in BASIC 7.0, and we think you will too! Have fun with the program and your new C-128. □ *SEE PROGRAM LISTING ON PAGE 94*

HEAD-ON

For the C-64

By John Fedor

Programs like *Spy Vs. Spy* have made game players realize how much fun it is to compete against someone else simultaneously on the computer screen. This is the point of *Head-On*. Player #1 controls the helicopter in the top half of the screen with a joystick in Port 1. Player #2 controls the helicopter in the bottom half of the screen with a joystick in Port 2 (in solitaire mode, the bottom copter is controlled by the computer). Moving the joystick up, down, left, or right moves the helicopter in that direction. Pressing the fire button shoots a large bullet in the direction you are facing.

While you move left or right, your copter seems to remain in the same position because the screen scrolls by you. This is an old technique used in Hollywood to simulate motion. In this game, hills are seen scrolling by.

The entire playfield is over three screens long, so if one helicopter gets close to another, it will appear on the other player's half of the screen. While it is difficult to explain, the overall effect is great.

You will need *Flankspeed* (page 83) in order to enter *Head-On*. Use C000 for the starting address and CF5E as the ending address. Once completely typed in, reset the computer and load *Head-On* as unrelocated memory (,8,1 or ,1,1). To start, type SYS49152 (RETURN). The title screen will be displayed. Choose 1 or 2 players. If one player, choose the computer difficulty (Easy or Hard). The computer plays a fair game, but the game can be fully enjoyed when playing against another human.

The game usually takes about 20-30 seconds to play before there is a winner. Because the game play is simple to learn, *Head-On* tends to be very addicting. The graphics are simple but effective, especially the smooth scrolling hills. So have fun blasting your best friend, or getting blasted by the computer. □

SEE PROGRAM LISTING ON PAGE 101

TIPS AHOY!

Compiled by Michael R. Davila

128 HI-RES SKETCH PAD

Here is a short routine that will let you use your joystick to draw on the hi-res screen of the C-128. Run it and you will be located at the top left corner of the screen (0,0). Start moving the joystick and drawing on the screen. To erase, just press the fire button and move the stick (draws in the background color). Clear the screen and start over by pressing f7. Press f1 to end and go back to the text screen. Once you are done, you can save your screen by entering in direct mode:

```
BSAVE"FNAME",D0,U8,B0,P7168 TO 16384
```

To LOAD the screen enter:

```
GRAPHIC1,1:GRAPHIC0:BLOAD"FNAME",D0,U8,B
0,P7168
```

where FNAME is a file name you give to your screen. You can change the color of the screen by changing line 1. COLOR 0,1 is for a black background. COLOR 1,2 is the foreground color. COLOR 4,1 is a black border. Change the second number in each of the commands to the color number that you want. The foreground color is the color that you will be drawing in.

—Richard Terry
San Francisco, CA

```
1 COLOR0,1:COLOR1,2:COLOR4,1:GRAPHIC 1,1
2 FORI=1TO8:KEY I,CHR$(I+132):NEXT
5 X=RDOT(0):Y=RDOT(1):CS=1
6 GETFK$
7 J=JOY(1)
9 IFFK$=CHR$(139)ANDJ=0THENSCNCLR1:X=0:Y
=0:GOTO5
10 IFFK$=CHR$(133)ANDJ=0THENGRAPHIC0:END
11 IFJ>128THENJ=J-128:CS=0:GOTO25
12 IFJ=0THEN5
15 IFJ=1THENY=Y-1:GOTO25
16 IFJ=2THENY=Y-1:X=X+1:GOTO25
17 IFJ=3THENX=X+1:GOTO25
18 IFJ=4THENY=Y+1:X=X+1:GOTO25
19 IFJ=5THENY=Y+1:GOTO25
20 IFJ=6THENY=Y+1:X=X-1:GOTO25
21 IFJ=7THENX=X-1:GOTO25
22 IFJ=8THENY=Y-1:X=X-1:GOTO25
25 IFX<0THENX=0
26 IFX>319THENX=319
29 IFY<0THENY=0
30 IFY>199THENY=199
100 DRAWCS,X,Y
150 GOTO5
```

MACHINE LANGUAGE COMBO LOCK

I use this programming technique to protect my ML programs from being used without my knowledge. It involves simply typing a set of three characters on the screen (known only by you) before doing a SYS on your program. If the code isn't entered on the screen, the program won't RUN.

Here's how it works. Include in the first line of your ML program a jump to subroutine (JSR) to location 1024, which is the screen memory starting address. Then, before you SYS your program, HOME the cursor and type a SPACE followed by two characters whose values equal the Low Order and High Order return address respectively. The sample program below will demonstrate this idea. Enter and RUN the following short program:

```
0 REM: ML COMBINATION LOCK DEMO
5 REM: BY DAVID S. KRAUSE
10 FORX=8000TO8015:READY:POKEX,Y:NEXTX
20 DATA32,0,4,169,8,141,24,6,169,9,141,2
```

```
5,6,76,67,31
```

Type NEW and CLEAR the screen. Move the cursor down once, type SYS 8000, and press RETURN. Notice that nothing happens. That's because the ML program you just loaded to locations 8000-8015 did not find your combination printed on the screen. Now HOME the cursor and type the following code starting at HOME position.

```
[SPACE][s C][BACKARROW]
```

Without hitting RETURN, move the cursor down to a clear area of the screen, type SYS 8000, and hit RETURN. Now you will find the word "HI" printed in the middle of the screen! Look at the first three bytes of the data in line 20 above. The ML program executes a JSR to the first location on the screen, unless the data at that screen location tells the program to JSR back to location 8003 to finish the program. The three spaces on the screen will read as a JSR (space=value 32) to location 8224 (L.O. address 32, followed by H.O. address 32). The values of the characters in the code you typed on the screen told the program to return and finish executing the program. You can use the *C-64 User's Guide*, Appendix E to find the character to represent the LOW and HIGH order return address to your ML program. This address is always preceded by a SPACE. The code can continue execution of your program at any address you choose. If you will continue execution of your ML program at the point right after the JSR to 1024, you may simply go to the HOME position and type a SHIFTED SPACE. This will look like a regular space on the screen, but the computer will think it is a Return from Subroutine(RTS) command. Try it on the program demo above and see! Keep a record of the "combinations" to each of your programs hidden away and your programs will be secure.

–David S. Krause
Grissom AFB, IN

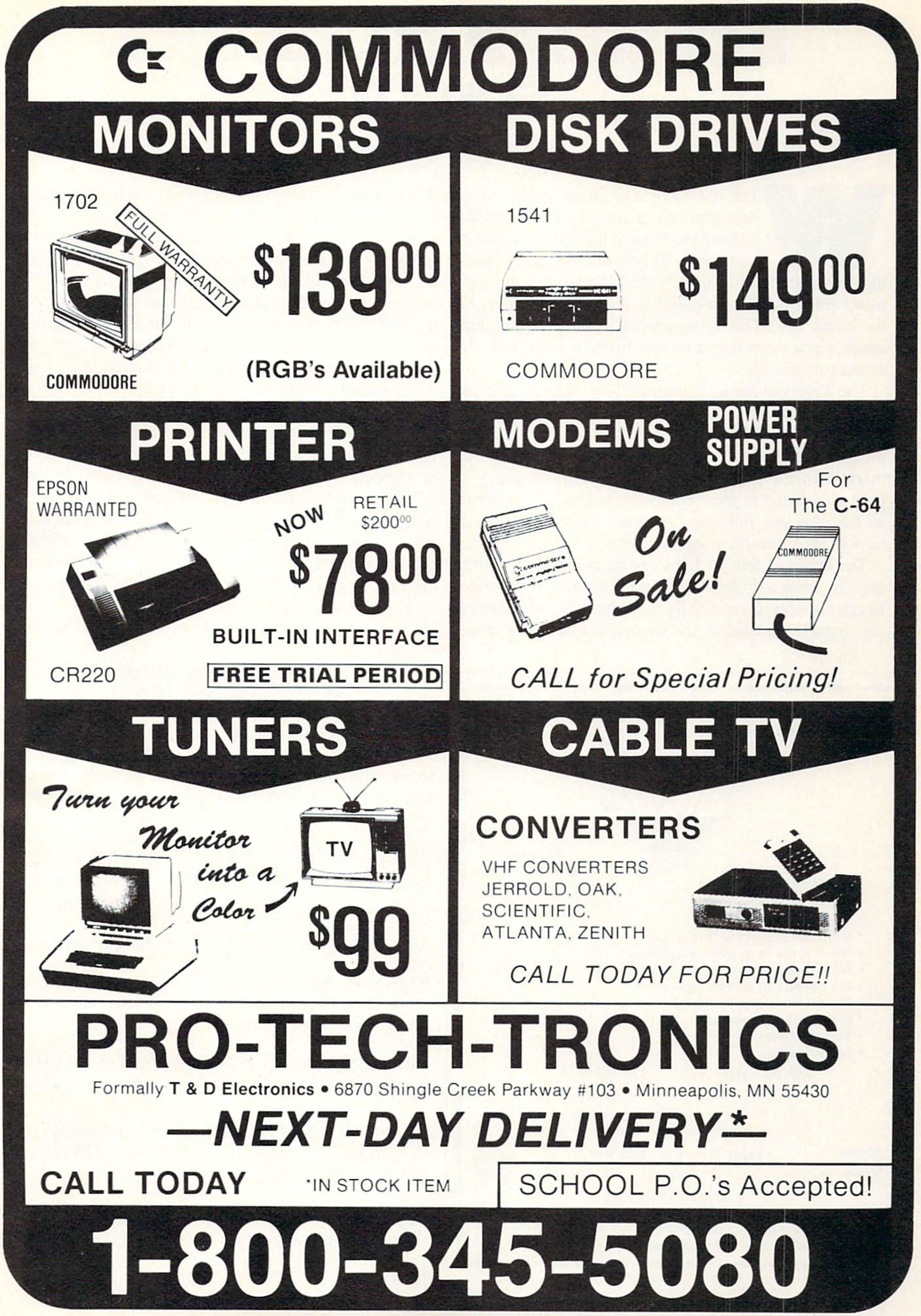
A LOT FOR A LITTLE

The C-128 boasts programmable function keys that can perform whole subroutines with a single keystroke. The following two lines program the f1 key to scratch a file named "PROGNAME.BK". The "ARE YOU SURE?" question is automatically answered with a "Y" and a carriage return. It then renames the latest disk version of "PROGNAME" to "PROGNAME.BK". Now it saves to disk the version of "PROGNAME" currently in computer memory.

```
10 A$=CHR$(34):B$=CHR$(13):C$="PROGNAME"
20 KEY1,"SCRATCH"+A$+C$+".BK"+A$+B$+"Y"+
B$+"RENAME"+A$+C$+A$+"TO"+A$+C$+".BK"+A$
+B$+"DSAVE"+A$+C$+A$+B$
```

Using this backup method, your disks are never cluttered with obsolete versions of the program under development. You will backup more often because, with a single keystroke, it's so easy.

–Edward Hogan
Coatesville, PA


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REVERSED REMARKS

For the C-64

By Jim Speers

When reviewing a program listing, either onscreen or in printed form, it is helpful to have the remark lines emphasized in some way. This is often done by entering blank lines to separate remark lines from the text, using either REM or a colon as the only characters on the blank line. This is somewhat wasteful of program space, since every line uses four bytes in addition to the content of the line.

The *Reversed Remark* program is written in machine language in the form of a basic loader. It operates by substituting a REVERSE-ON character for the last space prior to the text following each REMARK token. Remark lines will then be printed in reverse characters on both screen and printer. The entire program is scanned, so that remarks following program lines are reversed, as well as those on a separate line.

The reversed remark lines can be returned to normal print by using a different entry point to the ML program. Erasure works in essentially the same way, by changing the character just before the remark text back to a space. If one chooses the wrong entry point, no harm is done—the program simply remains unchanged.

To use the program, type it in and save a copy before running. Once it is run, any BASIC program may be loaded, and the remark lines reversed by entering SYS50500 in direct mode. Remarks are returned to normal by using SYS50505. The program is located in the middle of high memory, both to avoid interfering with other programs often loaded at 49152, and to provide an easily remembered pattern for the two entry points.

When the ML program is finished (which will probably be less than one second), it will list the revised BASIC program to the screen. This listing can be slowed or stopped with the CONTROL or RUN/STOP keys.

You will notice that the text of reversed remarks appears to have shifted one space to the left. This is because one space has been replaced with the REVERSE-ON character. If a line is found with no space between the remark token and the text, it will be skipped, and no reversal will occur. □

SEE PROGRAM LISTING ON PAGE 105

ERRATA

Chrono-Wedge (April '86)

Due to a logic error, the program would not permit the user to enter months 03 to 09. To correct the program use *Flankspeed* to LOAD *Chrono-Wedge*. Then press f7 to scan to line C7C0 and enter the following lines.

```
C7C0: F0 C9 32 B0 EC 8D D2 C9 75
C7C8: 8D E1 C9 20 CF FF F0 FB DE
C7D0: C9 30 90 DD C9 3A B0 D9 C7
```

After you are done, press f1 to save your new version.

Bigprint (May '86)

Improper CHR$ codes appeared in lines 140 and 890. Change those lines to read

```
140 PRINT"[BLACK]"CHR$(8)CHR$(142)TAB(9)
"[RVSON] BIG PRINT FUNCTIONS "

890 D1$=CG$+C$:D2$="[RVSON]"+CG$+C$:D3$=
"[CTRL N]"+CG$+C$:D4$="[CTRL N][RVSON]"+
CG$+C$:POKE646,CC
```

Star Search (May '86)

Line 2240 of the program should read

```
2240 REM VICTORY ROUTINE
```

WHAT'S UP, DOS?

By Cheryl Peterson

Many installments of the Cadet's Column have focused on BASIC. This is only natural, as BASIC is the "operating" language when you boot up most Commodore computers. Until you type in the right BASIC command, the Commodore will just sit and stare at you with its "READY" prompt's cursor blinking.

For those using CP/M on their 128, an A> prompt serves a similar purpose. There is a big difference between the two, though. Since CP/M is a disk operating system (DOS), as opposed to a programming language, you don't really write programs in CP/M. Instead, CP/M programs are written in assembly language. If you've heard hacker friends talking about doing assembly language programming for their Commodore computers, they are talking about a similar process.

Commodore computers (with the exception of the 128) don't come with a DOS, but they can be programmed to use one. An operating system actually just controls how the computer handles its parts and peripherals. Berkeley Softworks recently released *GEOS* (Graphic Environment Operating System) *deskTOP,* a Macintoshlike operating system for the Commodore. While such a complex operating system as *GEOS* is a wonderful development for first-time computer users, it does cost almost $80. A program for manipulating disk files can be had for much less. Many magazines have run DOS and DOS wedge programs, including *Ahoy!* (*DOS Wedge,* May 1985; *Chrono-Wedge,* April 1986). DOS programs can be found in the public domain as well.

The DOS program is usually just a small BASIC program, while the DOS wedge is usually a machine language routine. Most ordinary DOS programs reside on disk and are loaded and run when needed. A DOS wedge is loaded when you first start working. It puts itself in a seldom-used corner of memory and when you need it, one special key on the keyboard calls it out where you can use it. Wedges can sometimes interfere with other programs. This is especially true of commercial packages that frequently use the same memory "corners."

For this month, I'd planned to take a public domain C-64 DOS program and rewrite it for the C-128. I checked my local BBS's, CompuServe, and Viewtron, and couldn't find a suitable program. Most public domain programs now available, I learned, have been compiled. While this makes them run faster, it means you can't list the program and figure out how they work. It's a shame that the uncompiled versions weren't also available, since analyzing others' programs is a great way to pick up new programming techniques. Without the uncompiled "source code," experienced programmers can't improve the program without using a disassembler to take the original apart for analysis.

All is not lost, however. Since learning the multitude of commands needed to manage disks and disk files is a hassle, I decided to write a DOS program and use it as my sample. *Cadet's DOS 1541* works with VIC 20, C-64, C-128, and Plus/4 computers using 1541 or 1571 disk drives.

From that, I created the *Advanced Cadet's DOS* program. The advanced version runs on the 128 and uses commands created especially for the 1571. Both contain the same features, but they are designed a little differently. The 1541 version will work with the C-128 and 1571, since the 1571 understands all the 1541 commands.

```
CADET'S C-64 DOS

A  ACCESS DIRECTORY
B  BACKUP FILES
C  CONSOLIDATE FILES
D  DELETE FILES
E  ERROR STATUS
F  FORMAT DISK
G  GIVE FILE A NEW NAME
X  EXIT TO BASIC

ENTER LETTER SIGNIFYING YOUR CHOICE
WHAT IS YOUR REQUEST?
```

PROGRAM DESIGN

As usual, I designed this program both to be useful and to teach BASIC programming. I used a structured

approach, so the program is easy to understand and reasonably simple to modify. Someone with a little programming background could easily add subroutines to print a hard copy of the directory or to transfer programs between disks. For the sake of brevity, I chose not to include these in my program. Let's take a look at the 1541 version first.

The opening routine, from lines 1 to 99, prints the menu on the screen. As you can tell, 1-6 print the title. Lines 10-80 print the options on the screen. Line 90 gives the user instructions to prevent him from entering an unacceptable choice. Line 99 is the actual input statement that reads the choice.

The next section analyzes the user's choice and routes the program to the appropriate subroutine using IF/THEN statements. If an inappropriate response is made, the menu is repeated by going back to the top of the program, line 1.

A = 200	C = 400	E = 600	G = 800
B = 300	D = 500	F = 700	X = 1000

Before analyzing the input, the program clears the screen. This gives whatever subroutine is used next a clean slate to write on. It also avoids having to use a clear screen line in each subroutine. This is handled differently in the 128 version, but we'll get to that later.

The subroutine at 200 uses GET statements to take characters out of the directory, analyze them, and display them on the screen. Without going into a lot of detail, the area of the disk that holds the directory is really a file just like any other. So it can be read in from the disk, one character at a time. Line 252 opens the file"$" on device eight via channel one. This file is organized with a header at the front that contains material we don't need for our directory listing. The extra information is eliminated in lines 253 and 255. The rest of the information is printed with suitable titles being provided by our program.

The subroutine at 300 uses the copy file command sequence to make a copy of the file. The first part of line 262 opens the channel to the disk drive. The second half is the actual command. Before it can copy the file, though, it must use the subroutine at 2000 to get filenames to use in the command. The variable NF$ is used for the new filename and the variable SF$ is used for the source filename.

When using this command from direct mode in BASIC, you would open the channel to the drive and then type in the command C:"newfile"="sourcefile." Most of the disk commands have a similar structure which you can see by checking out the other subroutines.

The subroutine at 400 validates the disk. This command is used when you have files on the disk that weren't closed properly or if you have added and deleted a lot of files. It cleans up the disk and consolidates the files. The validate command should be used with extreme caution, as any file that is open will be deleted.

The subroutine at 500 deletes files. The way this routine is written, wildcards can be used to delete more than one file at a time. For instance, entering the filename TEST* would delete all the files that had T-E-S-T as the first four letters. Be careful with this one. Tell it to delete * and it will wipe your disk clean for you.

Occasionally when you try to use one of the functions you will get a disk drive error. The drive light starts blinking and you have no idea what is wrong. The error status option will read the error message from the drive and tell you what it is. It gives both the number code and the meaning.

The subroutine at 700 formats a disk. Lines 720 and 730 are used to get the diskname and extender. Since this routine can have dire consequences if used incorrectly, line 750 confirms the disk is to be erased. And unless the right character is entered, it aborts back to the menu.

The module at 800 uses the subroutine at 2000 to get the name of the file you want changed and the name you want to change it to. This is the same subroutine used by the "copy a file" routine. If you've been following this column, you know why this appears at the end of the program. A subroutine that is called by more than one other subroutine should be at the end.

The lines at 1000 exit to BASIC, but leave the program in memory. The reason I did this, rather than clear the memory and reset everything back to startup status, is not obvious at first.

Cadet's DOS 1541 is more convenient to use if it re-

sides on each disk. Since it only occupies 10 blocks, having it on all your disks isn't much of a sacrifice for the convenience gained. Because it doesn't remove itself from memory, putting the program on newly formatted disks is as easy as using option X to exit and then doing a SAVE. To get back into the program after the save, you need only type RUN.

CHANGES FOR THE 128 VERSION

Some of the changes made for the second version take advantage of the 1571's expanded instruction set. Commodore added commands to simplify the SCRATCH, DIRECTORY, COPY, RENAME, and FORMAT procedures. The advanced version takes advantage of the new SCRATCH, FORMAT, and DIRECTORY commands only. The new RENAME and COPY are actually more difficult to use than the old commands when they are accessed from inside a running program.

If you use the advanced commands from the BASIC prompt, they are much easier to use than their predecessors. COPY "newfile"="sourcefile" is certainly easier to use than the old format which requires opening a channel, typing in a cryptic command, and then closing the channel. When trying to use the new commands in a program you run into the problem of putting quotation marks around a variable.

In BASIC, anything surrounded by quotes is used verbatim. A variable surrounded by quotation marks is treated as a simple text string. With some manipulation it's possible to put quotation marks around the variable names, but by the time you've done that, you've negated the usefulness of the shortcut. An easier way that takes more programming space is not easier.

So I retained the COPY and RENAME subroutines from the original version.

The rest of the file manipulation subroutines take advantage of the 1571's simplified command structure. The subroutine at 200 is the most obviously improved. Not only does it save us many lines, it runs much faster than the old routine. A 20-line subroutine is reduced to 6 lines. And this includes two lines that serve only to improve the appearance of the information.

Two other subroutines use the expanded commands: delete a file and format a disk. Where it takes several commands to format a disk using 1541 commands, the HEADER command is all that is needed in 1571. The SCRATCH command has been similarly simplified.

For those who'd like a challenge, the HEADER command formats a disk in 1571 double-sided format. Can you change the program to offer the option of formatting either single- or double-sided? Hint: you'll need to retain the format command lines from the 1541 version.

Some changes were made for cosmetic reasons and I used them only to introduce you to one of the C-128's added BASIC commands. The window command makes it easier to control how information appears on the screen. With BASIC 2.0 on the C-64, complicated routines are needed to put information at specific locations. With the WINDOW

command of BASIC 7.0 this becomes much easier.

To open a window, you use the window command followed by four numbers. The full screen is represented as a matrix with lines 1-24 and columns 0-39 or 0-79 depending on whether you want to use 40 or 80 column mode. I chose to use 40 columns since not all 128 users will have the cable to access 80 column mode.

The four numbers of the window command represent the coordinates of the upper left and bottom right corners of your window. The first two are the upper line position followed by the upper column number. The remaining coordinates are the bottom line number and column number. So a window representing the full 40 column screen would use "WINDOW 1,0,24,39."

In the advanced program, I use four windows: the menu window, two input windows, and an error status window. Line 2 opens the menu window. The first input window is used to get the menu choice. The second is used for any supplementary information needed to complete the procedure chosen.

The error status window is an addition that makes a major change to the original program. The E option of the main menu has been changed to the EXIT TO BASIC option and the disk error status subroutine is accessed after each procedure finishes.

It is possible to do this in the original version and I encourage you dedicated BASIC programmers to try to make the necessary changes. Of course, use *Cadet's DOS 1541* to make a backup copy of the program to try your own programming skills on. You wouldn't want to mess up your only copy. If any of you would like to send your proposed modifications to *Ahoy!*, I may be able to acknowledge a few of them in a future column.

Please notice that line 198 actually routes the program to the ERROR subroutine still located at 600. Taking a closer look at this routine, you'll see that it opens a window at the bottom of the screen and then does an SCNCLR. This command replaces the PRINT "(CLR)" command used by the C-64's BASIC. One curious difference with the SCNCLR command is that it clears only the active window instead of the whole screen. This enables us to easily clear the error status window of any leftover information that was previously there without disturbing the rest of the screen.

In some cases this creates a bit of extra work. If you have several windows to clear to want to clear the whole screen, you may need an extra window specification to define the area you want cleared. For instance, in the exit to BASIC routine we redefine the window to encompass the whole screen.

As an aside, if you should exit the program by using the RUN/STOP key, the last window that you defined is the only active place on the screen. So I recommend using the EXIT function provided. Should you drop out by using RUN/STOP, the RESTORE key will put the screen back to normal.

NEXT MONTH

Starting next month, I'll be looking at alternatives to BASIC programming. For the moment, I plan to do columns on PASCAL and PROMAL. Both are similar to BASIC and should be easily assimilated by beginning computerists. We'll look at the differences and have a couple of sample programs to get us moving. If any of you have a language you'd like me to cover, let me know via *Ahoy!*

And for those you have modems, I can now be found on PlayNET, usually in the rooms called ICUG or The Hot Tub. On Thursday nights I might even be in *Ahoy!'s Port of Call.*

For those not into online communications, if you turn ;) sideways, you'll see a winking little face. There are a host of these faces that are used to (tele)communicate feelings without words. Take a guess at this one—:D

Because of naming conventions on PlayNET, I couldn't keep my old handle, Cherp!. Though all my old friends from Viewtron still call me Cherp! in messages, I'm masquerading under the screen name Cheryl P. Hope to see you there.

ICUG will soon be opening a section on the Source, so you'll be able to contact me there. And of course, I'm still on CompuServe. My user ID is 72366,2645. Please leave messages for me in the OCC forum of CIS, since I check in there daily. Type GO RADIO to get there.

(The second face is laughing.) :)

SEE PROGRAM LISTINGS ON PAGE 97

COMMODARES
PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette (1541 format only) are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #31-1: DATE DITTY

Given any date in the 1900's, determine the day of the week. How easily can you do that?

PROBLEM #31-2: CRYPTIC MATH

The letters A-J represent the numerals 0-9, but not necessarily in order. Find the values (if any) to make this statement true: AB * CDE = FGH * IJ. Also determine the largest and smallest values of the product.

PROBLEM #31-3: FARM FIGURES

This problem was submitted by Vern Leween (Brantford, ONT). You must buy 100 head of livestock and you must spend $100. You must buy at least one of each type animal at the following prices: cows are $10, sheep are $3, and pigs are $0.50 each. (Looks like a good deal on pigs!) Can you find any solutions?

PROBLEM #31-4: REPEATED COMPRESSION

Thomsen Fung (San Diego, CA) suggested this interesting little challenge. Write a program which compresses multiple characters into single ones in a string. For example, if the user enters "AAAHHOYYY!!!!!!", the program replies, "AHOY!". Loookksss lliiikke ffffuunnnnn.

The bag of letters for *Commodares* this month included several from readers around the globe. We received letters and programs from Ricardo Gil de la Torre (Del Valle, Mexico), Paul Vincent (Glen Osmond, South Australia), Leo Augusto Tarilonte (Rio de Janeiro, Brazil), Necah Buyukdura (Ankara, Turkey), and Nestor Hernandez (St. Augustine, Trinidad, West Indies), as well as these readers from Canada: Arthur Grant (Mahone Bay, Nova Scotia), Brian Goldman (Edmonton, Alberta), George Sammut (Etobicoke, Ontario), and Mark Breault (Brandon, Manitoba). Special thanks to these computerists for reading *Ahoy!* and for writing.

This month we will look at readers' responses to the March 1986 *Commodares. Problem #27-1: Left Overs* from Ted Grondski (Springfield, MA) brought solutions ranging from simple one-liners that ran in seconds to programs which required estimates of days to execute. The problem was to determine how many numbers from one to one million meet all of these criteria: when divided by 10 leaves a remainder of 9, when divided by 9 leaves a remainder of 8, ..., when divided by 2 leaves a remainder of 1.

The answer to the problem is 396. One of the more straightforward solutions is shown below from Robert Bailey (Rockford, IL).

```
·1 REM COMMODARES PROBLEM #27-1:
·2 REM       LEFT OVERS
·3 REM SOLUTION BY
·4 REM   ROBERT G. BAILEY
·5 REM
·10 FOR N=1 TO 1000000
·15 FOR T=10 TO 2 STEP -1
·20 IF N-(INT(N/T)*T)<>T-1 GOTO 40
·30 NEXT T:PRINT N;
·40 NEXT N
```

Every number from one to one million is divided by each value from ten to two. The remainder of N divided by T is given by the quantity in line 50: N – (INT(N/T)*T). Robert determined that this program would take around 3½ hours to complete the calculations.

In order to save wear and tear on the electrons in their computers, most readers performed some precomputing analysis to speed things up (and to keep their organic

computers cobweb-free). Some readers recognized that only odd numbers need to be tested because of the last condition stated. Other readers saw that only numbers in increments of ten beginning with 19 need to be tested because of the first condition of the problem.

Many others went a significant step further and concluded that only numbers in increments of 2520 beginning with 2519 would meet all the conditions of the problem. The number 2520 is the Least Common Multiple (LCM) of the nine divisors 2 through 10, that is, the smallest number into which each of the divisors goes evenly. Since the integral part of one million divided by 2520 is 396, there are 396 solutions starting at 2519 and increasing in multiples of 2520: 2519, 5039, ..., 997919.

If this conclusion is not obvious (and I am sure that it is not to everyone), consider a restatement of the problem. If a number N gives a remainder of 9 when divided by 10, then N+1 must be evenly divisible by 10. Similarly, if N divided by 9 gives a remainder of 8, then N+1 must be divisible by 9. Now the problem becomes one of finding a number N+1 which is divisible by 10, 9, 8, and so on. The smallest such number for N+1 is 2520, and therefore N must be 2519.

Still not obvious? Type in Robert's program and let it give you the answers. Isn't that what computers are for? If you are in a hurry, you might try this one-liner from Craig Ewert (Crystal Lake, IL) instead. It takes less than 15 seconds on the C-128 in FAST mode:

```
·1 REM COMMODARES PROBLEM #27-1:
·2 REM       LEFT OVERS
·3 REM SOLUTION BY
·4 REM   CRAIG EWERT
·5 REM
·10 FOR I=2519 TO 999999 STEP 2520:PRINT
 I:CT=CT+1:NEXT:PRINT"COUNT ="CT
```

Problem #27-2: Sound Challenge suggested by Wallace Leeker (Lemay, MO) brought some fine responses. The idea was to create any useful or unusual sound using few instructions. The program on page 99 is a compendium of the results.

The program runs on the C-64 or on the C-128. The menu allows you to easily select each sound. A few notes are in order. The simplest way to create a sound is to turn the volume control on and off to produce a click. That technique was used by several readers. It is exemplified by line 24 of the program.

The Sound Interface Device (SID) has 24 registers to program its three voices and sound modifiers. The lower four bits of address 54296 store a quantity from 0 to 15 representing the output loudness. Quickly changing the value from 15 to 0 generates a click on the loudspeaker. Generate enough clicks in rapid succession and you have a tone (or at least a buzz).

Thanks to these readers for their contributions to this program: Will Ludwigsen (Pt. Charlotte, FL), Ron Weiner (Levittown, PA), Ernest Barkman (Orlando, FL), Bob Snader (Baltimore, MD), Jim Speers (Niles, MI), David Palo (Escanaba, MI), Karen Middaugh (San Diego, CA), and John Prager (Bay City, MI).

The titles of the sounds should help you to recognize what you are hearing. Select number "1" and hold the space bar down for a motorboat or machine gun effect. "Airfleet" (number 6) uses three frequencies which are very close together. This generates the "beats." Notice the use of the DATA statement in line 71 to program the 24 registers.

Machines have been advertised for $100 or more which generate the sound of ocean waves. Now for two minutes' worth of typing you can have the same thing. If you are more at peace in the backwoods or swamplands, then "Froggy" is just for you. "Computers simulating stereotype computers" in the theme of numbers 7 and 8. One is the voice of a famous robot, and the other makes your computer do just what computers are supposed to do (they blink lights and beep according to the movies, anyway).

Change the slow gallop to a fast chase on the C-128 by entering FAST mode. Most of the sounds are quite different in FAST mode than in SLOW mode. Note that number 7, "Computer!", must be used in 40 column SLOW mode for the visual effects. Number 9 allows the user to enter a sweep rate. This is, in John Prager's words, "an attempt to compromise between the monotony of mathematical precision and the chaos of pure chance."

You may choose any hop value from 2 to 255. With values lower than 25, "regularity dominates," and with values greater than 55, "randomness holds sway." Thanks to John for the program and the poetry.

Len Lindsay (Madison, WI) mentioned that COMAL 2.0 includes keywords for sound control. In that language as well as BASIC 7.0, sophisticated sounds are created with just a few high-level commands. Len also mentioned that the simplest sounds are generated in COMAL with commands such as: USE system; bell(3).

Problem #27-3: Double Wedge from Tony Ruperto (Kitimat, BC) was a popular challenge. After the user inputs a sentence, the computer displays its two middle letters on the first line, followed by its four middle letters on the next line, and so forth, pyramid or Christmas-tree fashion.

There were dozens of good answers, many of which were very similar. The shortest solution was from Matt Shapiro (Ft. Lee, NJ):

```
·1 REM COMMODARES PROBLEM #27-3:
·2 REM       DOUBLE WEDGE
·3 REM SOLUTION BY
·4 REM       MATT SHAPIRO
·5 REM
·10 INPUT"QUE";S$:S$=S$+" ":L=INT(LEN(S$)
 /2):FORI=1TOL:PRINTTAB(20-I);MID$(S$,L-I
+1,2*I):NEXT
```

Many people recognized the problem of sentences with odd versus even numbers of letters and found nice, symmetrical solutions for both situations. James Borden (Carlisle, PA) simply added a period at the end of sentences containing odd numbers of characters. He tested for oddness with this statement:

```
IF LEN(A$) AND 1 THEN A$=A$+"."
```

Any odd number ANDed with one gives one, and any even number ANDed with one gives zero. John Prager (Bay City, MI) used a similar test in his program below:

```
·1 REM COMMODARES PROBLEM #27-3:
·2 REM       DOUBLE WEDGE
·3 REM SOLUTION BY
·4 REM       JOHN R. PRAGER
·5 REM
·10 INPUT"PHRASE";A$
·20 L=LEN(A$):B=1 AND L:P=2-B
·30 S=INT(.5+L/2)
·40 FOR J=S TO 1 STEP -1
·50 PRINT SPC(J-1)MID$(A$,J,P):P=P+2:NEXT
```

This program puts a single character on the top line if

the sentence has an odd number of characters, and it puts two characters on top for sentences with even numbers of letters.

Several readers rallied to meet Jim Speers' challenge, *Problem #27-4: Token Lister.* Some of the solutions used the dynamic keyboard method to list one line of the program after the program had modified itself. The two solutions below use different techniques. The first from James Borden (Carlisle, PA) PEEKS into BASIC ROM and prints the characters one by one.

```
·1 REM COMMODARES PROBLEM #27-4:
·2 REM       TOKEN LISTER
·3 REM SOLUTION BY
·4 REM       JAMES BORDEN
·5 REM > > >  C-64 ONLY  < < <
·6 REM
·10 Z=41118:FOR X=128 TO 203:PRINT X;
·20 A=PEEK(Z) :Z=Z+1 :IF A<128 THEN PRINT
  CHR$(A);:GOTO 20
·30 PRINT CHR$(A-128),:NEXT
```

The last character of each keyword has 128 added to its ASCII value. That is the reason for the PRINT statement in line 30. For computers other than the C-64, you must change the ROM starting address from 41118 and change the number of tokens. Try using 49310 on the VIC 20 and 45234 on the Commodore 8032 for the starting address. Thanks to Paul Sisul (St. Louis, MO) for the 8032 address.

On the C-128, the starting address is 17431, and the value of X should range from 128 to 299. Some of the higher-valued tokens on the C-128 will not be numbered properly since they are stored as two bytes. (A good challenge for you C-128 users would be to fix up this program.)

Another approach is shown in this program from Mark Breault (Brandon, Manitoba).

```
·100 REM
·300 FORT=128TO203:POKE2051,T:POKE2053,T:
 PRINT"[CLEAR][5"[DOWN]"]NEXT[HOME]":LIST
 -203
·1001 REM COMMODARES PROBLEM #27-4:
·1002 REM       TOKEN LISTER
·1003 REM SOLUTION BY
·1004 REM       MARK BREAULT
·1005 REM > > >  C-64 ONLY  < < <
·1006 REM NOTE: LINE 100 MUST BE TYPED!
·1007 REM   PRESS RETURN FOR EACH TOKEN
```

Mark's program modifies line 100 and then LISTs itself. The user must press the RETURN key for each keyword with the cursor at the NEXT statement printed on the screen. Be sure to type line 100 as an empty REM statement. The 100 and the REM are at the memory locations being modified by the program. Again, this technique could easily be changed for computers other than the C-64 by replacing the starting address for BASIC text storage with the appropriate value.

Congratulations to the following readers who haven't already been mentioned this month: Todd Wostrel (Lincoln, NE), Nolan Whitaker (Jeffersonville, KY), Bill Hoyt (Battle Creek, MI), Frank T. Smith (Wilmington, DE), Ray Carter (Las Cruces, NM), Michael Hommer (Waukee, IA), Tim Moore (Pea Ridge, AR), Al Brownley & Bill Manganaro, Pat & Angie McConville (Manassas Park, VA), Peter Troy (Casco, ME), Douglas Underwood (Walla Walla, WA), Richie France (Red Bank, TN), Robert Fletcher (Joplin, MO), Joe McDevitt (Piedmont, MO), Thomsen Fung (San Diego, CA), Brian Wilcox (Coldwater, OH), David Hoffner (Brooklyn, NY), Jerry Torres (Daggett, CA), Bill Campbell (Newburgh, NY), Rob Olson (Bemidji, MI), Charles Grady (Cleveland, TN), Michael Marron (Stony Brook, NY), Marc Warm (East Meadow, NY), Keith Kushner, Jeanne Marie Perry (Brooklyn, NY), Wesley Dever Jr. (Hartford, CT), Herbert Holland (Aberdeen Proving Ground, MD), Eddie Byrd (White Oak, MO), Fred Simon (Gibbsboro, NJ), and Lon Olson (Mesa, AZ).

If you have solved some interesting programming problems, send them along and let others work on them. Be sure to put your address on your program listings since the envelopes are discarded. We're looking forward to your challenges and solutions for next month. □

SEE PROGRAM LISTING ON PAGE 99

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart. The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. ☐

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type		You Will See
[CLEAR]	Screen Clear	SHIFT	CLR/HOME	
[HOME]	Home		CLR/HOME	
[UP]	Cursor Up	SHIFT	↑ CRSR ↓	
[DOWN]	Cursor Down		↑ CRSR ↓	
[LEFT]	Cursor Left	SHIFT	← CRSR →	
[RIGHT]	Cursor Right		← CRSR →	
[SS]	Shifted Space	SHIFT	Space	
[INSERT]	Insert	SHIFT	INST/DEL	
[DEL]	Delete		INST/DEL	
[RVSON]	Reverse On	CNTRL	9	
[RVSOFF]	Reverse Off	CNTRL	0	
[UPARROW]	Up Arrow		↑	
[BACKARROW]	Back Arrow		←	
[PI]	PI		π	
[EP]	English Pound		£	

When You See	It Means	You Type		You Will See
[BLACK]	Black	CNTRL	1	
[WHITE]	White	CNTRL	2	
[RED]	Red	CNTRL	3	
[CYAN]	Cyan	CNTRL	4	
[PURPLE]	Purple	CNTRL	5	
[GREEN]	Green	CNTRL	6	
[BLUE]	Blue	CNTRL	7	
[YELLOW]	Yellow	CNTRL	8	
[F1]	Function 1		F1	
[F2]	Function 2	SHIFT	F1	
[F3]	Function 3		F3	
[F4]	Function 4	SHIFT	F3	
[F5]	Function 5		F5	
[F6]	Function 6	SHIFT	F5	
[F7]	Function 7		F7	
[F8]	Function 8	SHIFT	F7	

BUG REPELLENT By MICHAEL KLEINERT and DAVID BARRON

Bug Repellent is a checksum program used for proofreading BASIC listings typed in from *Ahoy!* magazine. For each program line you enter, *Bug Repellent* will produce a two-letter code that should match the code listed beside that line in the magazine.

Type in, save, and run the *Bug Repellent*. (If you have a C-64, type in the C-64 version. If you have a C-128, you will need to type in the C-64 version for use with C-64 programs, and the C-128 version for use with C-128 programs.) If you have typed in *Bug Repellent* properly, you will get the message BUG REPELLENT INSTALLED; otherwise you will get an error message. If you get an error message, double check the *Bug Repellent* program for typing mistakes. Type NEW and hit RETURN. Then type in and save, or load, the *Ahoy!* program you wish to check. Type in SYS 49152 for the C-64 version or SYS 3072 for the C-128 version and hit RETURN (this will begin execution of *Bug Repellent*). You will see the prompt SCREEN OR PRINTER ? Hit S if you want the codes listed on the screen, or P if you want them listed on the printer. To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to those listed to the right of the corresponding program lines. If you spot a difference, that line contains an error. Write down the numbers of the lines where the contradictions occur. LIST each line, locate the errors, and correct them.

COMMODORE 64 VERSION

```
·100 FOR X = 49152 TO 49488:READY:S=S+Y          AB
·110 IF Y<0 OR Y>255 THEN 130                    EA
·120 POKE X,Y:NEXT:GOTO140                       ID
·130 PRINT"[CLEAR][DOWN]**ERROR**":PRINT"[DOWN
]PLEASE CHECK LINE"PEEK(64)*256+PEEK(63):END     ID
·140 IF S<>44677 THEN PRINT"[CLEAR][DOWN]**ERR
OR**":PRINT"[DOWN]PLEASE CHECK DATA LINES 170
-500":END                                        HJ
·150 PRINT"[CLEAR]":POKE53280,0:POKE53281,6:PO
KE646,1                                          NP
·160 PRINT"[RVSON][6" "]C-64 BUG REPELLENT INS
TALLED[6" "]"                                    LF
·170 DATA32,161,192,165,43,133,251,165,44,133    DL
·180 DATA252,160,0,132,254,32,37,193,234,177     DB
·190 DATA251,208,3,76,138,192,230,251,208,2      OF
·200 DATA230,252,76,43,192,76,73,78,69,32        KN
·210 DATA35,32,0,169,35,160,192,32,30,171        CA
·220 DATA160,0,177,251,170,230,251,208,2,230     CE
·230 DATA252,177,251,32,205,189,169,58,32,210    JE
·240 DATA255,169,0,133,253,230,254,32,37,193     CL
·250 DATA234,165,253,160,0,76,13,193,133,253     NB
·260 DATA177,251,208,237,165,253,41,240,74,74    MB
·270 DATA74,74,24,105,65,32,210,255,165,253      EP
·280 DATA 41,15,24,105,65,32,210,255,169,13      GH
·290 DATA32,220,192,230,63,208,2,230,64,230      AN
·300 DATA251,208,2,230,252,76,11,192,169,153     NG
·310 DATA160,192,32,30,171,166,63,165,64,76      BF
·320 DATA231,192,96,76,73,78,69,83,58,32         EP
·330 DATA0,169,247,160,192,32,30,171,169,3       PJ
·340 DATA133,254,32,228,255,201,83,240,6,201     FK
·350 DATA80,208,245,230,254,32,210,255,169,4     FL
·360 DATA166,254,160,255,32,186,255,169,0,133    CL
·370 DATA63,133,64,133,2,32,189,255,32,192       GC
·380 DATA255,166,254,32,201,255,76,73,193,96     NN
·390 DATA32,210,255,173,141,2,41,1,208,249       NH
·400 DATA96,32,205,189,169,13,32,210,255,32      IM
·410 DATA204,255,169,4,76,195,255,147,83,67      KC
·420 DATA82,69,69,78,32,79,82,32,80,82           DC
·430 DATA 73,78,84,69,82,32,63,32,0,76           ML
·440 DATA44,193,234,177,251,201,32,240,6,138     GN
·450 DATA113,251,69,254,170,138,76,88,192,0      JK
·460 DATA0,0,0,230,251,208,2,230,252,96          NA
·470 DATA170,177,251,201,34,208,6,165,2,73       DM
·480 DATA255,133,2,165,2,208,218,177,251,201     JA
·490 DATA32,208,212,198,254,76,29,193,0,169      FM
·500 DATA13,76,210,255,0,0,0                     PA
```

COMMODORE 128 VERSION

```
·100 FAST:FOR X = 3072 TO 3520:READ Y:POKE X,Y
:S=S+Y:TRAP110:NEXT:SLOW                         IH
·110 SLOW:IF S<>49057 THEN PRINT"[CLEAR][DOWN]
**ERROR**":PRINT"[DOWN]PLEASE CHECK DATA LINE
S 140-390":END                                   JA
·120 PRINT"[CLEAR][DOWN]  C-128 BUG REPELLENT
INSTALLED"                                       II
·130 PRINT"[4" "]TYPE SYS 3072 TO ACTIVATE"      IN
·140 DATA 32,161,12,165,45,133,251,165,46,133,
252,160,0,132,254,32,37                          OF
·150 DATA 13,234,177,251,208,3,76,138,12,230,2
51,208,2,230,252,76,43                           NC
·160 DATA 12,76,73,78,69,32,35,32,0,169,35,160
,12,32,80,13,160,0,177                           OL
·170 DATA 251,170,230,251,208,2,230,252,177,25
1,32,89,13,169,58,32,98                          EF
·180 DATA 13,169,0,133,253,230,254,32,37,13,23
4,165,253,160,0,76,13                            JO
·190 DATA 13,133,253,177,251,208,237,165,253,4
1,240,74,74,74,74,24                             LC
·200 DATA 105,65,32,98,13,165,253,41,15,24,105
,65,32,98,13,169,13,32                           DE
·210 DATA 220,12,230,65,208,2,230,66,230,251,2
08,2,230,252,76,11,12                            GM
·220 DATA 169,153,160,12,32,80,13,166,65,165,6
6,76,231,12,96,76,73,78                          CP
·230 DATA 69,83,58,32,0,169,247,160,12,32,80,1
3,169,3,133,254,32,107                           HC
·240 DATA 13,201,83,240,6,201,80,208,245,230,2
54,32,98,13,169,4,166                            GK
·250 DATA 254,160,255,32,116,13,169,0,133,65,1
33,66,133,250,32,125,13                          LB
·260 DATA 32,134,13,166,254,32,143,13,76,73,13
,96,32,98,13,165,211                             JF
·270 DATA 234,41,1,208,249,96,32,89,13,169,13,
32,98,13,32,152,13,169,4                         GD
·280 DATA 76,161,13,147,83,67,82,69,69,78,32,7
9,82,32,80,82,73,78,84,69                        PL
·290 DATA 82,32,63,32,0,76,44,13,234,177,251,2
01,32,240,6,138,113,251,69                       OK
·300 DATA 254,170,138,76,88,12,0,0,0,0,230,251
,208,2,230,252,96,170,177                        FJ
·310 DATA 251,201,34,208,6,165,250,73,255,133,
250,165,250,208,218,177                          GA
·320 DATA 251,201,32,208,212,198,254,76,29,13,
0,169,13,76,98,13,0,0,32                         FI
·330 DATA 170,13,32,226,85,76,180,13,32,170,13
,32,50,142,76,180,13,32                          OF
·340 DATA 170,13,32,210,255,76,180,13,32,170,1
3,32,228,255,76,180,13,32                        AK
·350 DATA 170,13,32,186,255,76,180,13,32,170,1
3,32,189,255                                     BP
·360 DATA 76,180,13,32,170,13,32,192,255,76,18
0,13,32,170,13                                   FP
·370 DATA 32,201,255,76,180,13,32,170,13,32,20
4,255,76,180,13,32,170                           ID
·380 DATA 13,32,195,255,76,180,13,133,67,169,0
,141,0,255,165,67,96                             BJ
·390 DATA 133,67,169,0,141,1,255,165,67,96,0,0
,0                                               IF
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 – SAVEs what you have entered so far.

f3 – LOADs in a program worked on previously.

f5 – To continue on a line you stopped on after LOADing in the previous saved work.

f7 – Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11 LL
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]"; ED
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
]" MC
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]" DM
·120 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNATIONAL INC.
[3" "]" DH
·125 FORA=54272TO54296:POKEA,0:NEXT IM
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
KE54296,15 NH
·135 FORA=680TO699:READB:POKEA,B:NEXT KO
·140 DATA169,251,166,253,164,254,32,216,255,96 HJ
·145 DATA169,0,166,251,164,252,32,213,255,96 JB
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B HC
·155 GOSUB480:IFB=0THEN150 FO
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16 KE
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B IF
·170 GOSUB470:IFB=0THEN150 FP
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16 MN
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1 GE
·185 POKE253,B:PRINT HN
·190 REM  GET HEX LINE IL
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8 FG
·200 FORB=0TO1:GOTO250 MD
·205 NEXTB ME
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340 LH
·215 PRINT" [c P][LEFT]"; IK
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" " PD
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255 LK
·230 NEXT IA
·235 IFA%(8)<>TTHENGOSUB375:GOTO195 FK
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195 MN
·245 REM    GET HEX INPUT AB
·250 GETA$:IFA$=""THEN250 HO
·255 IFA$=CHR$(20)THEN305 GC
·260 IFA$=CHR$(133)THEN535 MD
·265 IFA$=CHR$(134)THEN560 KF
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620 GE
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635 BJ
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295 GM
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295 LE
·290 GOSUB415:GOTO250 LL
·295 PRINTA$"[c P][LEFT]"; OA
·300 GOTO205 CG
·305 IFA>0THEN320 OP
·310 A=-1:IFB=1THEN330 OB
·315 GOTO220 CJ
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1 HG
·325 A=A-1 BE
·330 PRINTCHR$(20);:GOTO220 KH
·335 REM LAST LINE AD
·340 PRINT" ":T=AD-(INT(AD/256)*256) GJ
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255 PL
·350 NEXT IA
·355 IFA%(A)<>TTHENGOSUB375:GOTO195 KF
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT HN
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535 ON
·370 REM BELL AND ERROR MESSAGES FL
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415 DH
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415 JA
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
5 HD
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
GOTO415 AG
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415 KN
·400 PRINT"?ERROR IN SAVE":GOTO415 EI
·405 PRINT"?ERROR IN LOAD":GOTO415 GL
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT PG
·415 POKE54276,17:POKE54276,16:RETURN BH
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN IM
·425 REM GET FOUR DIGIT HEX PC
·430 PRINT:PRINTB$;:INPUTT$ GM
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430 II
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
 380:GOTO430 AD
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN GF
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN EH
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN KP
·460 T(A)=16:RETURN NP
·465 REM ADRESS CHECK LI
·470 IFAD>ENTHEN385 MI
·475 IFB<SRORB>ENTHEN390 MG
·480 IFB<256OR(B>4096ANDB<49152)ORB>53247THEN395 MI
·485 RETURN IM
·490 REM ADDRESS TO HEX EB
·495 AC=AD:A=4096:GOSUB520 HG
·500 A=256:GOSUB520 CE
·505 A=16:GOSUB520 PN
·510 A=1:GOSUB520 MJ
·515 RETURN IM
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530 CJ
·525 A$=CHR$(T+48) JP
·530 PRINTA$;:AC=AC-A*T:RETURN AC
·535 A$="**SAVE**":GOSUB585 AI
·540 OPEN1,T,1,A$:SYS680:CLOSE1 LH
·545 IFST=0THENEND EO
·550 GOSUB400:IFT=8THENGOSUB420 FJ
·555 GOTO535 FF
·560 A$="**LOAD**":GOSUB585 AB
·565 OPEN1,T,0,A$:SYS690:CLOSE1 MF
·570 IFST=64THEN195 JH
·575 GOSUB405:IFT=8THENGOSUB420 CM
·580 GOTO560 FO
·585 PRINT" ":PRINTTAB(14)A$ FG
·590 PRINT:A$="":INPUT"FILENAME";A$ OM
·595 IFA$=""THEN590 GF
·600 PRINT:PRINT"TAPE OR DISK?":PRINT DF
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN IG
·610 IFB$<>"T"THEN605 FN
·615 RETURN IM
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B DK
·625 GOSUB475:IFB=0THEN620 MA
·630 PRINT:GOTO195 OI
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B FH
·640 GOSUB475:IFB=0THEN635 NK
·645 PRINT:GOTO670 DI
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
OSUB410:GOTO195 BK
·655 PRINT" ";:NEXTB EC
·660 PRINT:AD=AD+8 GN
·665 GETB$:IFB$=CHR$(136)THEN195 MN
·670 GOSUB495:PRINT": ";:GOTO650 JD
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81-83 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

MAPPING THE C-128

FROM PAGE 25

COPYCHRS.S

```
1000 ;
1010 ; COPYCHRS.S
1020 ;
1030 *=$1300
1040 ;
1050 CHRBAS = $D000 ;START
 OF CHR ROM
1060 NEWADR = $2000 ;START
 OF NEW CHR RAM
1070 TABLEN = $800 ;LENGTH
 OF CHR ROM
1080 MVSRCE = $FA ;PTR TO
$D000
1090 MVDEST = MVSRCE+2 ;PT
R TO $2000
1100 LENPTR = $C3 ;TEMP AD
R FOR TABLEN
1110 GETCFG = $FF6B ;KERNA
L BANK-SWITCHING SUBROUTIN
E
1120 INDFET = $FF74
1130 ;
1140 ; POKE CHR DATA INTO
NEW LOCATION
1150 ;
1160  LDA #<CHRBAS
1170  STA MVSRCE
1180  LDA #>CHRBAS
1190  STA MVSRCE+1
1200 ;
1210  LDA #<NEWADR
1220  STA MVDEST
1230  LDA #>NEWADR
1240  STA MVDEST+1
1250 ;
1260  LDA #<TABLEN
1270  STA LENPTR
1280  LDA #>TABLEN
1290  STA LENPTR+1
1300 ;
1310 ; MOVE STARTS HERE
1320 ;
1330  LDA #0
1340  STA $FF00 ;USE BANK
15
1350  LDY #0
1360  LDX LENPTR+1
1370  BEQ MVPART
1380 MVPAGE JSR GETDATA
1390  INY
1400  BNE MVPAGE
1410  INC MVSRCE+1
1420  INC MVDEST+1
1430  DEX
1440  BNE MVPAGE
1450 MVPART LDX LENPTR
1460  BEQ MVEXIT
1470 MVLAST JSR GETDATA
1480  INY
1490  DEX
1500  BNE MVLAST
1510 MVEXIT LDA #0
1520  STA $FF00 ;USE BANK
15
1530  RTS
1540 ;
1550 ; SUBROUTINE TO STORE
 (MVSRCE),Y IN (MVDEST),Y
1560 ;
1570 GETDATA PHA
1580  TXA
1590  PHA
1600  LDA #MVSRCE
1610  LDX #14 ;GET DATA FR
OM BANK 14
1620  JSR INDFET
1630  JSR STORDATA ;IN BAN
K 0
1640  PLA
1650  TAX
1660  PLA
1670  RTS
1680 ;
1690 STORDATA
1700  STA $FF01 ;USE BANK
0
1710  STA (MVDEST),Y
1720  LDA #0 ;RETURN TO BA
NK 15
1730  STA $FF00
1740  RTS
```

COPYCHRS.BAS

```
•5 REM **** COPYCHRS.BAS ****                 GC
•7 REM                                        JD
•8 REM A PROGRAM TO MOVE THE C-128'S CHAR
 ACTER SET FROM ROM INTO RAM                  KK
•9 REM                                        JD
•10 DATA 255,129,129,129,129,129,129,255      IG
•15 REM                                       JD
•20 POKE 217,4:REM PLACE ADDRESS OF NEW C
 HAR SET IN CHAR-SET POINTER                  LJ
•30 GRAPHIC 2,1:REM MOVE START OF BASIC U
 P TO $4000                                   AB
•40 POKE 2604,PEEK(2604) AND 240 OR 8:REM
  TELL VIC CHIP WHERE TO FIND NEW CHAR SE
 T                                            MO
•50 FAST:REM SPEED UP CHAR-COPYING OPERAT
 ION                                          CI
•60 FOR L=0 TO 2047:BANK 14:C=PEEK(53248+
 L):BANK 0:POKE 8192+L,C:NEXT L:REM POKE
 CHAR DATA INTO NEW LOCATION                  DE
•70 SLOW:REM RESUME NORMAL CPU SPEED          KF
•80 COLOR 0,7:COLOR 4,7:COLOR 5,2:REM SET
  SCREEN, BORDER AND CHAR COLORS              DI
•90 FOR L=0 TO 7:READ S:POKE 8192+0*8+L,S
 :NEXT L:REM CHANGE '@' CHAR TO A BOX         EN
•100 GRAPHIC 0,1:REM USE 40-COL TEXT MODE     IF
•110 PRINT "@";:REM USE REDEFINED '@' CHA
 R AS A CURSOR                                DK
•120 GETKEY A$:PRINT CHR$(20);:PRINT A$;:
 REM GET INPUT, BACKSPACE TO COVER UP CUR
 SOR, AND PRINT TYPED CHAR ON SCREEN          OG
•130 GOTO 110:REM GET NEXT INPUT CHAR         AL
```

FIDGITS' MUSIC SCHOOL

FROM PAGE 34

```
•5 REM"[c A][30"[s *]"][c S]"                 LE
•6 REM"[s B][5" "]FIDGITS MUSIC SCHOOL[5"
 "][s B]"                                     IB
•7 REM"[s B][5" "]BY  WALTER E. MEYERS[5"
 "][s B]"                                     PM
•8 REM"[c Z][30"[s *]"][c X]"                 JI
•10 POKE 56576,PEEK(56576)OR 3:POKE 53272
 ,21:POKE 648,4:POKE 53269,0:GOTO 1000        KH
•20 POKE S+1,HI:POKE S,LO:POKE S+4,17:FOR
```

```
 T=1 TO 100:NEXT:POKE S+4,16:RETURN          KN
•30 POKE 198,0:WAIT 198,1:II=PEEK(631):PO
 KE 198,0:RETURN                             OP
•50 POKE 781,LN:POKE 782,COL:POKE 783,0:S
 YS 65520:RETURN                             KJ
•60 FOR C=54272 TO 54296:POKE C,0:NEXT:RE
 TURN                                        EB
•90 N=INT(RND(0)*D)+1:RETURN                 MM
•98 :                                        DI
•99 REM TITLE PAGE                           CM
•100 GOSUB 60:FOR I=5 TO 20 STEP 7:POKE S
 +I,0:POKE S+I+1,240:NEXT:POKE S+24,15       IN
•110 PRINT"[CLEAR]":FOR I=1 TO 6:PRINT:NE
 XT:FOR J=1 TO 3:FOR I=1 TO 4                KG
•120 PRINT F$(I) SPC(18) F$(I);:NEXT:NEXT
 :LN=11:COL=18:GOSUB 50:PRINT B7$:M=1        ON
•130 LL=8:N=12:FOR I=1 TO 30:LN=6:COL=18:
 GOSUB 50:PRINT M$(M):LN=LL:COL=12           IL
•140 GOSUB 50:PRINT WL$:COL=23:GOSUB 50:P
 RINT WR$:D=18:GOSUB 90:HI=HI(N)             OJ
•150 LO=LO(N):GOSUB 20:LL=ABS(17-LL):M=AB
 S(3-M):NEXT:FOR T=1 TO 100:NEXT             DK
•158 :                                       DI
•159 REM INSTRUCTIONS                        GO
•160 PRINT"[CLEAR][DOWN][DOWN]":FOR I=1 T
 O 4:PRINT F$(I) SPC(18) F$(I);:NEXT:PRIN
 T                                           IO
•170 PRINT"[c 4][4" "]FIDGITS CAN HELP YO
 U LEARN TO READ[DOWN][4" "]MUSIC.  YOU W
 ILL SEE SO";                                JN
•180 PRINT"ME NOTES ON A[DOWN][4" "]STAFF
 , WITH A FIDGIT UNDER EACH ONE.[DOWN][4"
 "]HIT THE ";                                MI
•190 PRINT"KEY THAT HAS THE NAME OF THE[D
 OWN][4" "]NOTE ON IT.  WHEN ALL YOUR NOT
 ES A";                                      PB
•200 PRINT"RE[DOWN][4" "]RIGHT, THE FIDGI
 TS WILL SPELL A WORD[DOWN][4" "]HIDDEN I
 N THE MUSIC."                               HL
•208 :                                       DI
•209 REM LOAD FONT                           AA
•210 POKE 56334,PEEK(56334) AND 254:POKE
 1,PEEK(1) AND 251:SYS 49152                 NE
•220 POKE 1,PEEK(1) OR 4:POKE 56334,PEEK(
 56334) OR 1                                 IE
•230 READ K:IF K=999 THEN 250                JH
•240 FOR J=0 TO 7:READ I:POKE 61440+(K*8)
 +J,I:NEXT:GOTO 230                          KN
•250 PRINT"[DOWN]  [c 5][RVSON] HIT ANY K
 EY WHEN READY TO CONTINUE.":GOSUB 30        JJ
•260 POKE 56576,PEEK(56576) AND 252:POKE
 53272,44:POKE 648,200                       MD
•298 :                                       DI
•299 REM GET CLEF                            HO
•300 POKE V+23,3:POKE V+29,3:POKE V+39,0:
 POKE V+40,0:POKE V,100:POKE V+1,120         BG
•305 POKE V+2,220:POKE V+3,120:POKE 52216
 ,1:POKE 52217,2:PRINT"[CLEAR][4"[DOWN]"]
 "                                           IJ
•310 PRINT TAB(15)"[BLACK]PICK ONE:":POKE
 V+21,3:LN=15:COL=0:GOSUB 50:PRINT B8$       CD
•320 GOSUB 30:IF II<70 OR II>71 THEN 320     FB
•330 POKE V+21,0:POKE V+23,1:POKE V+29,1:
 POKE V,28:POKE V+2,60:POKE 52217,3          FN
•340 GAME=0:SA=0:CL=7:CA=14:IF II=70 THEN
 POKE 52216,2:CL=0:SA=-20:CA=0:WRD=0         BA
•348 :                                       DI
•349 REM MAIN LOOP                           PK
•350 PRINT"[CLEAR]":POKE S+24,15:FOR I=0
 TO 5:PRINT TAB(5) KB$(I):NEXT:PRINT:PRIN
 T                                           PA
•360 FOR I=0 TO 4:PRINT CL$(I):NEXT:POKE
 V+21,1:LN=15:COL=4                          BA
•400 IF WRD=40 THEN FOR I=1 TO 51:W(I)=0:
 NEXT                                        GK
•405 J=3:P=2:D=51:GOSUB 90:IF W(N)=1 THEN
 405                                         FG
•410 L=LEN(W$(N)):W(N)=1:WRD=WRD+1:FOR I=
 1 TO L:P$=MID$(W$(N),I,1)                   KE
•415 POKE 52216+I,3:ON ASC(P$)-64 GOTO 42
 0,430,480,450,460,470,440                   EB
•420 Y=128:NO=6:LC(I)=16:GOTO 490:REM A      GO
•430 Y=124:NO=7:LC(I)=18:GOTO 490:REM B      PO
•440 Y=132:NO=5:LC(I)=14:GOTO 490:REM G      KG
•450 Y=144:NO=2:LC(I)=8:GOTO 490:REM D       CP
•460 Y=140:NO=3:LC(I)=10:GOTO 490:REM E      DF
•470 Y=136:NO=4:LC(I)=12:GOTO 490:REM F      HK
•480 Y=148:NO=1:LC(I)=6:IF CL=7 THEN POKE
 52216+I,4:REM MIDDLE C                      EN
•490 Y=Y+SA:NO=NO+CL:LC(I)=LC(I)+CA          ED
•500 POKE V+39+I,2:POKE V+J,Y:POKE V+21,P
 EEK(V+21)+P:GOSUB 50:PRINT HO$:LN=20        EJ
•510 GOSUB 50:PRINT"[GREEN]"B$(0):HI=HI(N
 O):LO=LO(NO):GOSUB 20:LN=15:GOSUB 50:N1(
 I)=NO                                       AH
•520 PRINT HC$:POKE V+39+I,0:COL=COL+4:J=
 J+2:P=P*2:NH(I)=HI:NL(I)=LO:NEXT:LN=20      HC
•530 COL=4:FOR I=1 TO L:P$=MID$(W$(N),I,1
 ):GOSUB 50:PRINT"[WHITE]" B$(0):POKE V+3
 9+I,2                                       NH
•540 GOSUB 30:J=II                           MJ
•550 IF CHR$(J)<>P$ THEN POKE V+39+I,1:LN
 =15:GOSUB 50:PRINT HS$:GOTO 540             NI
•560 LN=20:GOSUB 50:PRINT B$(J-64):LN=15:
 GOSUB 50:PRINT HO$:HI=NH(I):LO=NL(I)        DG
•570 GOSUB 20:GOSUB 50:PRINT HC$:C1=COL+4
 :LN=5:COL=LC(I):GOSUB 50:PRINT"[BLACK]"
 P$                                          KN
•580 LN=20:COL=C1:NEXT:LN=15:COL=4           AI
•598 :                                       DI
•599 REM SHOW OFF                            LK
•600 FOR I=1 TO L:GOSUB 50:PRINT HO$:POKE
 S+1,HI(N1(I)):POKE S,LO(N1(I))              CD
•610 POKE S+8,HI(N1(I)+3):POKE S+7,LO(N1(
 I)+3):POKE S+15,HI(N1(I)+5)                 AO
•620 POKE S+14,LO(N1(I)+5):POKE S+4,17:PO
```

```
KE S+11,17:POKE S+18,17:FOR T=1 TO 300   IC
•630 NEXT:GOSUB 50:POKE S+4,16:POKE S+11,
16:POKE S+18,16:PRINT HC$:COL=COL+4   CE
•640 NEXT:C1=COL:LN=8:COL=14:GOSUB 50:PRI
NT"[RVSON][c 5]HIT ANY KEY":GOSUB 30:COL
=C1   DK
•650 GAME=GAME+1:IF GAME<7 THEN 350   NE
•698 :   DI
•699 REM NEW/END GAME   KA
•700 POKE V+21,0:POKE S+24,0:GOSUB 900:GO
SUB 950:GOSUB 30:IF II<>81 THEN 300   PD
•710 GOSUB 900:PRINT:GOSUB 980:LN=3:COL=1
3:FOR I=1 TO 21:GOSUB 50:PRINT WL$   KN
•720 FOR T=1 TO 100:NEXT:LN=ABS(5-LN):NEX
T:POKE 53272,21:POKE 648,4   JF
•730 POKE 56576,PEEK(56576) OR 3:PRINT"[C
LEAR][c 7]":POKE SC,6:POKE BO,14:NEW:END NE
•898 :   DI
•899 REM NEST SBRTN   GK
•900 PRINT"[CLEAR][DOWN][DOWN]":PRINTTAB(
18) B1$:PRINTTAB(18) B2$:PRINTTAB(16) LE
FT$(NE$,3);   IA
•910 PRINT B3$ LEFT$(NE$,3):PRINTTAB(13)
LEFT$(NE$,6) B4$ LEFT$(NE$,6)   MK
•920 PRINTTAB(11) LEFT$(NE$,6)"[RVSOFF]"
B5$ LEFT$(NE$,6):PRINTTAB(10) LEFT$(NE$,
4);   JL
•930 PRINT "[RVSOFF]" B6$ LEFT$(NE$,4):PR
INTTAB(8) NE$:PRINTTAB(9) LEFT$(NE$,22)   NJ
•940 PRINTTAB(10) LEFT$(NE$,20):PRINTTAB(
11) LEFT$(NE$,18):RETURN   GN
•948 :   DI
•949 REM BANNER SBRTNS   DF
•950 PRINTTAB(9)"[DOWN][RVSON][RED] [c A]
[s I][s A] [s U][s I][s A][s A] [s U][s
I][s U][s I][s U][s I][s A][c A][s I][s
U][s I] ":PRINTTAB(9)"[RVSON] [c Q][s K]
[s B] [c Q][c W][s J][c W] [c Q][c W][s
B][c S][c Q][c W][3"[s B]"][s U][s K] "   MC
•960 PRINTTAB(9)"[RVSON] [s X] [c Z][s S]
[s X][s X] [s X] [s X][s X][s J][s K][5"
[s X]"][s Q]  ":PRINT TAB(9)"[c 4][DOWN]
HIT[c L][RVSON]Q[RVSOFF][c J]TO QUIT OR
ANY"   GF
•970 PRINTTAB(9)"OTHER KEY TO PLAY AGAIN.
":RETURN   OD
•980 PRINTTAB(11)"[RVSON][RED] [s U][s I]
[s U][s I] [s A] [s U][s I][c A][s I][s
U][s I] [s A] ":PRINTTAB(11)"[RVSON] [s
J][s I][s B][s B] [s B] [5"[s B]"][c S]
[s B] "   DM
•990 PRINTTAB(11)"[RVSON] [s J][s K][s J]
[s K] [c Z][s S][s J][s K][s X][s X][s J
][s K] [s Q] ":RETURN   PA
•998 :   DI
•999 REM INITIALIZE   HA
•1000 PRINT"[CLEAR][3"[DOWN]"][5"[RIGHT]"
][BLACK]ONE MOMENT, PLEASE.":POKE 53281,
15:POKE 53280,15:S=54272   FL
•1010 X=RND(-TI):DIM B$(7),HI(19),LO(19),
NH(19),NL(19),F$(4),M$(2),W$(52),W(52)   BC
•1020 FOR TYPE=49152 TO 49184:READ A:POKE
 TYPE,A:NEXT   IA
•1030 FOR SPRITE=49216 TO 49471:READ A:PO
KE SPRITE,A:NEXT   HK
•1040 FOR WRD=1 TO 51:READ A$:W$(WRD)=A$:
NEXT   LD
•1050 FOR MUSIC=1 TO 18:READ A:HI(MU)=INT
(A/256):LO(MU)=A-(HI(MU)*256):NEXT   EL
•1060 V=53248:POKE V+23,3:POKE V+29,3:POK
E V+39,0:POKE V+40,0:POKE V,100   OC
•1070 POKE V+1,120:POKE V+2,220:POKE V+3,
120:POKE 52216,1:POKE 52217,2:H=92   LO
•1080 FOR I=V+4 TO V+14 STEP 2:POKE I,H:H
=H+32:NEXT   HO
•1098 :   DI
•1099 REM STRINGS   NA
•1100 HC$="[4" "][DOWN][4"[LEFT]"][WHITE]
[s U][s C][s C][s I][DOWN][4"[LEFT]"][s
B][BLACK][RVSON]**[WHITE][RVSOFF][s B][D
OWN][4"[LEFT]"][s B][c 1][RVSON]$%[WHITE
][RVSOFF][s B][DOWN][4"[LEFT]"][s J][c R
][c R][s K][DOWN][4"[LEFT]"]"   FN
•1110 HO$="[WHITE][s U][s C][s C][s I][DO
WN][4"[LEFT]"][s B][RED][RVSON][sEP][c *
][RVSOFF][WHITE][s B][DOWN][4"[LEFT]"][s
 B][RED][c *][sEP][WHITE][s B][DOWN][4"[
LEFT]"][s J][c R][c R][s K][DOWN][4"[LEF
T]"] [s -][s -] "   NH
•1120 HS$="[4" "][DOWN][4"[LEFT]"][WHITE]
[RVSON]/[RVSOFF][c P][c P][RVSON]0[DOWN]
[4"[LEFT]"]1[BLACK]22[WHITE]3[DOWN][4"[L
EFT]"]4[c 1]$%[WHITE]5[DOWN][4"[LEFT]"][
RVSOFF][s J][c R][c R][s K][DOWN][4"[LEF
T]"]"   HN
•1130 B$(0)="[RVSON]&  '[DOWN][4"[LEFT]"]
[3" "][c M][DOWN][4"[LEFT]"][3" "][c M]"
:B$(1)="[RVSON][c 5]&[s U][s I]'[DOWN][4
"[LEFT]"] [c Q][c W] [DOWN][4"[LEFT]"] [
s X][s X] "   DG
•1140 B$(2)="[RVSON][RED]&[c A][s I]'[DOW
N][4"[LEFT]"] [c Q][s Z] [DOWN][4"[LEFT]
"] [c Z][s K] ":B$(3)="[RVSON][PURPLE]&[
s U][s I]'[DOWN][4"[LEFT]"] [s B]  [DOWN
][4"[LEFT]"] [s J][s K] "   DG
•1150 B$(4)="[RVSON][BLUE]&[c A][s I]'[DO
WN][4"[LEFT]"] [s B][s B] [DOWN][4"[LEFT
]"] [c Z][s K] ":B$(5)="[RVSON][c 1]&[c
A][s S]'[DOWN][4"[LEFT]"] [c Q][s S] [DO
WN][4"[LEFT]"] [c Z][s S] "   JO
•1160 B$(6)="[RVSON][c 7]&[c A][s S]'[DOW
N][4"[LEFT]"] [c Q][s S] [DOWN][4"[LEFT]
"] [s X]  ":B$(7)="[RVSON][BLACK]&[s U][
s I]'[DOWN][4"[LEFT]"] [s B][c S] [DOWN]
[4"[LEFT]"] [s J][s K] "   JE
•1170 B1$="[WHITE][s U][s *][s *][s I]":B
```

```
2$="[WHITE][s B][BLACK][RVSON]**[WHITE][
RVSOFF][s B][c 2]":B3$="[RVSOFF][WHITE][
s B][c 1][RVSON]$%[WHITE][RVSOFF][s B][c
 2]":B4$="[RVSOFF][WHITE][s J][c R][c R]
[s K][c 2]"                             DN
·1180 B5$="  [RVSON][RED]&  '[RVSOFF][c 2
]  ":B6$="[5" "][RVSON][RED][4" "][RVSOF
F][c 2][5" "]"                          GP
·1190 B7$="[GREEN][RVSON][sEP]  [c *][DOW
N][4"[LEFT]"][4" "][DOWN][4"[LEFT]"][4"
"]":NE$="[RVSON]())[3"("]))()())()())()(
())"                                    EA
·1200 B8$="[c 5]PRESS[6" "][BLACK]G[6" "]
[c 5]OR[6" "][BLACK]F"                  AH
·1210 WL$="[WHITE][5" "][DOWN][5"[LEFT]"]
[c A][3"[s *]"][s I][DOWN][5"[LEFT]"][s
J][c R]  [s B][DOWN][4"[LEFT]"][s J][c R
] [c Z][DOWN][3"[LEFT]"][s J][s *][s *][
DOWN][3"[LEFT]"][3" "]"                 JC
·1220 WR$="[WHITE][5" "][DOWN][5"[LEFT]"]
[s U][3"[s *]"][c S][DOWN][5"[LEFT]"][s
B]  [c R][s K][DOWN][5"[LEFT]"][c X] [c
R][s K][DOWN][4"[LEFT]"][s *][s *][s K][
DOWN][3"[LEFT]"][3" "][c 4]"            KP
·1230 F$(1)="[RED][s U][s I][s S] [c S]
[s S][3" "]":F$(2)="[s +] [c S][s U][c W
][s U][c S][c S][s +][s U][s I]":F$(3)="
[c E] [c E][s J][c E][s J][c W][c E][s J
][s J][s I]"                            HA
·1240 F$(4)="[5" "][s J][s K]  [s J][s K]
":M$(2)="[c 1][RVSON][c *][RVSOFF]  [RVS
ON][sEP][DOWN][5"[LEFT]"][WHITE][RVSOFF]
[s U][RVSON][c 1] [c *][sEP] [RVSOFF][WH
ITE][s I]"                              GM
·1250 M$(1)="[c 1] [RVSON][sEP][c *][RVSO
FF] [DOWN][5"[LEFT]"][WHITE][s U][RVSON]
[c 1][sEP]  [c *][WHITE][RVSOFF][s I][DO
WN][6"[LEFT]"][s B]  [BLACK][s Q][WHITE]
 [s B][DOWN][6"[LEFT]"][s B][4" "][s B][
DOWN][6"[LEFT]"][s J][s *][c S][c A][s *
][s K]"                                 IF
·1300 C1$="[37"[s *]"]":C2$="[c 4][c A]":
C3$="[c Q]":C4$="[c Z]"                 HM
·1310 CL$(0)=C2$+C1$:CL$(1)=C3$+C1$:CL$(2
)=CL$(1):CL$(3)=CL$(1):CL$(4)=C4$+C1$   GD
·1320 KB$(0)="[RVSON][WHITE][s -] [BLACK]
 [WHITE] [BLACK] [WHITE] [s -] [BLACK] [
WHITE] [BLACK] [WHITE] [BLACK] [WHITE] [
s -] [BLACK] [WHITE] [BLACK] [WHITE] [s
-] [BLACK] [WHITE] [BLACK] [WHITE] [BLAC
K] [WHITE] [s -]"                       HP
·1330 KB$(1)=KB$(0):KB$(2)=KB$(0):KB$(3)=
"[RVSON][WHITE][s -] [s -] [s -] [s -] [
s -] [s -] [s -] [s -] [s -] [s -] [s -]
 [s -] [s -] [s -] [s -]"               AB
·1340 KB$(4)=KB$(3):KB$(5)="[RVSON][WHITE
][s +][c I][s +][c I][s +][c I][s +][c I
][s +][c I][s +][c I][s +][c I][s +][c I
][s +][c I][s +][c I][s +][c I][s +][c I
][s +][c I][s +][c I][s +]"             AI
·1990 GOTO 100                          CF
·1999 :                                 DI
·2199 REM COPY FONT                     BD
·2200 DATA 169,0,133,251,133,253,169,208 HB
·2210 DATA 133,252,169,240,133,254,162  DJ
·2220 DATA 16,160,0,177,251,145,253,136 LE
·2230 DATA 208,249,230,252,230,254,202  JH
·2240 DATA 208,240,96                   IL
·2298 :                                 DI
·2299 REM G CLEF SPRITE                 NO
·2300 DATA 0,64,0,0,240,0,0,216,0       KH
·2310 DATA 0,204,0,0,204,0,0,216,0      HN
·2320 DATA 0,240,0,0,224,0,1,192,0      MB
·2330 DATA 3,192,0,6,192,0,12,192,0     DJ
·2340 DATA 27,240,0,54,216,0,108,204,0  GA
·2350 DATA 108,204,0,54,216,0,24,240,0  EL
·2360 DATA 15,224,0,0,192,0,1,128,0,0   FA
·2398 :                                 DI
·2399 REM F CLEF SPRITE                 ON
·2400 DATA 0,0,0,0,0,0,0,0,0            JH
·2410 DATA 15,0,0,25,140,0,48,204,0     GJ
·2420 DATA 54,96,0,28,96,0,0,108,0      CK
·2430 DATA 0,108,0,0,96,0,0,96,0        JM
·2440 DATA 0,192,0,1,128,0,3,0,0        AO
·2450 DATA 6,0,0,0,0,0,0,0,0            ON
·2460 DATA 0,0,0,0,0,0,0,0,0,0          NC
·2498 :                                 DI
·2499 REM NOTE SPRITE                   MJ
·2500 DATA 0,0,0,0,0,0,0,0,0            JH
·2510 DATA 0,0,0,0,0,0,0,0,0            JH
·2520 DATA 0,0,0,0,0,0,0,0,0            JH
·2530 DATA 0,0,0,0,0,0,0,0,0            JH
·2540 DATA 0,0,0,0,0,0,0,0,0            JH
·2550 DATA 1,255,128,7,255,224,15,255,248 MH
·2560 DATA 15,255,248,7,255,224,1,255,128
,0                                      KO
·2598 :                                 DI
·2599 REM MIDDLE C                      JC
·2600 DATA 0,0,0,0,0,0,0,0,0            JH
·2610 DATA 0,0,0,0,0,0,0,0,0            JH
·2620 DATA 0,0,0,0,0,0,0,0,0            JH
·2630 DATA 0,0,0,0,0,0,0,0,0            JH
·2640 DATA 0,0,0,0,0,0,0,0,0            JH
·2650 DATA 1,255,128,7,255,224,255,255,25
5                                       PH
·2660 DATA 255,255,255,7,255,224,1,255,12
8,0                                     JI
·2698 :                                 DI
·2699 REM WORDS                         CE
·2700 DATA"ABED","ACCEDE","ACE","ADD","AG
E","AGED"                               CO
·2710 DATA"BABE","BAD","BAG","BAGGAGE","B
EAD","BEADED","BED","BEDDED","BEE"      IE
·2720 DATA"CAB","CAGE","CAGED","CAFE","CA
BBAGE","CAD","CEDE","CEDED"             AI
·2730 DATA"DAB","DAD","DECADE","DEAD","DE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81-83 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
ED","DEFACE","DEFACED","DEAF"                OF
•2740 DATA"EBB","EDGE","EDGED","EFFACE","
EFFACED","EGG","EGGED"                       EH
•2750 DATA"FACADE","FACE","FACED","FADE",
"FADED","FAD","FED","FEE","FEED"             FI
•2760 DATA"GAB","GAFF","GAG","GEE"           KH
•2798 :                                      DI
•2799 REM NOTE FREQUENCIES                   AM
•2800 DATA 2145,2408,2703,2864,3215,3608,
4050,4291,4817,5407,5728,6430,7217           JE
•2810 DATA 8101,8583,9634,10814,11457        OG
•3098 :                                      DI
•3099 REM CUSTOM FONT DATA                   NE
•3164 DATA164,63,113,57,31,15,7,3,1          NN
•3165 DATA165,252,142,156,248,240,224,192
,128                                         PH
•3166 DATA166,15,15,7,15,31,63,127,255       CO
•3167 DATA167,240,240,224,240,248,252,254
,255                                         EI
•3168 DATA168,49,155,206,236,63,115,206,7
2                                            FG
•3169 DATA169,140,217,115,55,252,206,115,
18                                           ME
•3170 DATA170,126,231,0,60,126,60,0,0        AE
•3175 DATA175,0,0,0,0,0,0,7,15               IL
•3176 DATA176,0,0,0,0,0,0,224,240            FC
•3177 DATA177,28,24,24,12,12,24,48,48        DN
•3178 DATA178,60,102,195,24,60,60,60,24      FB
•3179 DATA179,56,24,24,48,48,24,12,12        AO
•3180 DATA180,24,28,14,7,7,14,28,24          DG
•3181 DATA181,24,56,112,224,224,112,56,24    JE
•3193 DATA193,255,255,255,195,195,195,195
,195                                         BI
•3194 DATA194,195,195,195,195,195,195,195
,195                                         CI
•3201 DATA201,255,255,255,15,7,131,195,19
5                                            JI
•3202 DATA202,195,195,193,224,240,255,255
,255                                         OH
•3203 DATA203,195,195,131,7,15,255,255,25
5                                            AA
•3211 DATA211,255,255,255,3,3,255,255,255    JM
•3213 DATA213,255,255,255,240,224,193,195
,195                                         ND
•3216 DATA216,195,195,195,195,195,255,255
,255                                         NC
•3218 DATA218,195,195,135,15,15,135,195,1
95                                           PO
•3219 DATA219,231,231,195,0,0,0,0,0          PA
•3235 DATA235,195,195,195,192,192,195,195
,195                                         HE
•3237 DATA237,195,195,195,192,192,255,255
,255                                         BB
•3238 DATA238,255,255,255,3,3,195,195,195    KI
•3240 DATA240,255,255,255,192,192,195,195
,195                                         IF
•3243 DATA243,195,195,195,3,3,195,195,195    ML
•3999 DATA 999                               CP
```

LOOPS GALORE!
FROM PAGE 20

INSERTION SORT 128

```
•1 REM                                       JD
•2 REM  > INSERTION SORT 128 <               PM
•3 REM     RUPERT REPORT #31                 OJ
•4 REM  =-=-  FOR C-128  -=-=                FD
•10 N=20                                     GH
•20 DIM A(N) : A(0)=-1E37                    II
•30 REM - INPUT THE ARRAY                    MN
•40 GOSUB 220                                CA
•50 REM - SORT THE ARRAY                     IA
•60 GOSUB 110                                CG
•70 REM - PRINT THE SORTED ARRAY             FI
•80 GOSUB 300                                CD
•90 END                                      IC
•100 :                                       DI
•110 REM == INSERTION SORT ==                KK
•120 :                                       DI
•130 FOR I=2 TO N                            JO
•140    V=A(I) : J=I                         GA
•150    DO WHILE A(J-1)>V                    MD
•160       A(J)=A(J-1) : J=J-1               JK
•170    LOOP                                 OO
•180    A(J)=V                               OM
•190 NEXT I                                  MN
•200 RETURN                                  IM
•210 :                                       DI
•220 REM == INPUT ARRAY ==                   JD
•230 :                                       DI
•240 FOR K=1 TO N                            KD
•250  A(K)=INT(RND(1)*100)                   CO
•260  PRINT A(K);                            LF
•270 NEXT K                                  MP
•280 RETURN                                  IM
•290 :                                       DI
•300 REM == PRINT ARRAY ==                   LM
•310 :                                       DI
•320 PRINT:PRINT"SORTED:"                    KC
•330 FOR K=1 TO N                            KD
•340  PRINT A(K);                            LF
•350 NEXT K                                  MP
•360 RETURN                                  IM
```

INSERTION SORT 64

```
•1 REM                                       JD
•2 REM  > INSERTION SORT 64 <                NE
•3 REM     RUPERT REPORT #31                 OJ
```

```
·4 REM  =-=- BASIC 2.0 -=-=                  CJ
·10 M$="THIS IS A TEST MESSAGE"              FI
·15 N=LEN(M$)                                HE
·20 DIM A$(N) : A$(0)=""                     LH
·30 REM - INPUT THE ARRAY                    MN
·40 GOSUB 220                                CA
·50 REM - SORT THE ARRAY                     IA
·60 GOSUB 110                                CG
·70 REM - PRINT THE SORTED ARRAY             FI
·80 GOSUB 300                                CD
·90 END                                      IC
·100 :                                       DI
·110 REM == INSERTION SORT ==                KK
·120 :                                       DI
·130 FOR I=2 TO N                            JO
·140    V$=A$(I) : J=I                       MB
·150    IF A$(J-1)<=V$ THEN 180              LH
·160      A$(J)=A$(J-1) : J=J-1              BB
·170    GOTO 150                             CG
·180 A$(J)=V$                                DN
·190 NEXT I                                  MN
·200 RETURN                                  IM
·210 :                                       DI
·220 REM == INPUT ARRAY ==                   JD
·230 :                                       DI
·240 FOR K=1 TO N                            KD
·250 A$(K)=MID$(M$,K,1)                      BO
·260 PRINT A$(K);                            OK
·270 NEXT K                                  MP
·280 RETURN                                  IM
·290 :                                       DI
·300 REM == PRINT ARRAY ==                   LM
·310 :                                       DI
·320 PRINT:PRINT"SORTED:"                    KC
·330 FOR K=1 TO N                            KD
·340 PRINT A$(K);                            OK
·350 NEXT K                                  MP
·360 RETURN                                  IM
```

SCREEN SLEUTH
FROM PAGE 39

```
·10 REM *** SCREEN SLEUTH *** BUCK CHILDR
ESS (02/12/86) ***                          FA
·20 REM *** P.O. BOX 13575 SALEM, OR 9730
9 ***                                       DC
·30 PRINTCHR$(147)"LOADING AND CHECKING D
ATA[3"."]":PRINT:J=49152:L=90:C=11          MB
·40 FORB=0TOC:READA:POKEJ+B,A:X=X+A:NEXTB
:READA                                      FE
·50 IFX<>ATHENPRINT"ERROR IN DATA LINE"L:
END                                         MC
·60 X=0:J=J+12:L=L+10:IFL<460THEN40         AI
·70 IFL=460THENC=13:GOTO40                  EL
·80 PRINT"DATA OK AND LOADED[3"."]":PRINT
:PRINT"SYS 49152 TO ACTIVATE[3"."]":END     MM
·90 DATA173,20,3,174,21,3,224,192,240,30,
141,208,1429                                FI
·100 DATA193,142,209,193,169,41,162,192,1
20,141,20,3,1585                            AK
·110 DATA142,21,3,142,215,193,142,216,193
,142,219,193,1821                           GJ
·120 DATA142,220,193,88,96,173,220,193,20
1,127,240,68,1961                           GO
·130 DATA173,215,193,201,127,208,48,133,2
04,173,141,2,1818                           EI
·140 DATA208,8,32,159,255,32,228,255,240,
46,169,127,1759                             IN
·150 DATA141,220,193,160,39,140,215,193,1
85,224,193,153,2056                         EB
·160 DATA0,4,185,16,194,153,0,216,136,16,
241,32,1193                                 OG
·170 DATA225,255,240,251,76,146,193,165,2
07,208,9,165,2140                           KG
·180 DATA145,201,127,208,6,141,219,193,10
8,208,193,173,1922                          KH
·190 DATA219,193,201,127,208,246,141,215,
193,141,220,193,2297                        IP
·200 DATA165,206,174,135,2,141,217,193,20
1,32,208,3,1677                             LK
·210 DATA174,33,208,142,218,193,169,0,162
,4,133,251,1687                             IL
·220 DATA133,252,134,253,165,211,208,4,16
5,214,240,16,1995                           EB
·230 DATA169,157,133,204,32,210,255,230,2
51,208,237,230,2316                         CK
·240 DATA252,76,160,192,160,39,132,204,18
5,0,4,153,1557                              NH
·250 DATA224,193,185,0,216,41,15,153,16,1
94,136,16,1389                              GF
·260 DATA239,173,134,2,141,212,193,173,33
,208,41,15,1564                             HP
·270 DATA141,134,2,160,39,169,32,153,0,4,
136,16,986                                  NL
·280 DATA250,200,132,199,133,254,32,210,2
55,173,0,4,1842                             BI
·290 DATA205,217,193,240,57,169,20,32,210
,255,230,254,2082                           AF
·300 DATA165,254,201,128,144,232,201,160,
176,5,169,160,1995                          CL
·310 DATA76,232,192,201,192,144,219,169,1
8,205,216,193,2057                          EC
·320 DATA240,10,141,216,193,133,199,169,3
2,76,232,192,1833                           FK
·330 DATA32,179,193,32,168,193,169,63,32,
210,255,76,1602                             HF
·340 DATA68,193,32,179,193,169,0,166,254,
32,160,193,1639                             GO
·350 DATA173,216,193,201,18,208,5,169,42,
32,210,255,1722                             ME
·360 DATA169,0,174,217,193,32,160,193,173
,218,193,41,1763                            GM
·370 DATA15,170,169,0,32,160,193,32,94,19
3,169,216,1443                              LB
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81-83 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
•380 DATA133,253,166,251,165,252,24,101,2
53,32,160,193,1983                        EN
•390 DATA165,253,48,1,96,32,197,193,173,2
12,193,141,1704                           MM
•400 DATA134,2,165,251,208,4,165,252,240,
20,169,29,1639                            LN
•410 DATA133,204,32,210,255,198,251,165,2
51,201,255,208,2363                       IA
•420 DATA233,198,252,76,118,193,169,192,1
41,216,193,141,2122                       PG
•430 DATA219,193,141,220,193,108,208,193,
72,32,168,193,1940                        EI
•440 DATA104,76,205,189,169,32,160,2,32,2
10,255,136,1570                           BC
•450 DATA16,250,96,162,0,173,33,208,41,15
,208,1,1203                               KF
•460 DATA232,142,134,2,169,13,32,210,255,
169,19,76,210,255,1918                    BJ
```

ESCAPE FROM SKULL CASTLE

FROM PAGE 36

```
•10 REM     ESCAPE FROM SKULL CASTLE      LB
•12 REM     BY JC HILTY                   EH
•14 V=53248:S=54272:TM=2500:M=4:SC=0:K=0  AO
•20 PRINT"[CLEAR]"TAB(8)"ESCAPE FROM SKUL
L CASTLE":PRINT"[4"[DOWN]"]ONE MOMENT-RE
ADING DATA"                               MO
•22 GOSUB700:GOSUB600:GOSUB500:GOSUB550   CN
•30 POKEV+21,255:POKE50432,191:SYS51104   DA
•31 W1=PEEK(V+30):W2=PEEK(V+31)           OE
•34 R=INT(2*RND(9)+3)                     DK
•35 POKE49522,R:POKE49523,6:POKE49524,7:P
OKE49525,2:POKE49526,23:SYS49152          NF
•36 W1=PEEK(V+30):IFW1>127THEN200         NB
•37 W2=PEEK(V+31):IFW2>127THEN300         OJ
•38 GOSUB100                              CJ
•39 POKE49522,3:POKE49523,13:POKE49524,14
:POKE49525,2:POKE49526,23:SYS49152        CJ
•40 W1=PEEK(V+30):IFW1>127THEN200         NB
•41 W2=PEEK(V+31):IFW2>127THEN300         OJ
•42 GOSUB100                              CJ
•43 POKE49522,4:POKE49523,22:POKE49524,23
:POKE49525,2:POKE49526,7:SYS49152         AE
•44 W1=PEEK(V+30):IFW1>127THEN200         NB
•45 W2=PEEK(V+31):IFW2>127THEN300         OJ
•46 GOSUB100                              CJ
•47 POKE49522,3:POKE49523,22:POKE49524,23
:POKE49525,17:POKE49526,23:SYS49152       DO
•48 W1=PEEK(V+30):IFW1>127THEN200         NB
•49 W2=PEEK(V+31):IFW2>127THEN300         OJ
•50 GOSUB100                              CJ
•51 R=INT(2*RND(9)+3)                     DK
•52 POKE49522,R:POKE49523,31:POKE49524,32
:POKE49525,2:POKE49526,23:SYS49152        OI
•53 W1=PEEK(V+30):IFW1>127THEN200         NB
•54 W2=PEEK(V+31):IFW2>127THEN300         OJ
•55 TM=TM-5:PRINT"[HOME]"TAB(6)"[5" "]":P
RINT"[HOME][BLUE]"TAB(6);TM:IFTM=0THEN40
0                                         BF
•56 W1=PEEK(V+30):IFW1>127THEN200         NB
•57 W2=PEEK(V+31):IFW2>127THEN300         OJ
•58 GOSUB100                              CJ
•59 GOTO34                                PF
•100 POKE50447,0:POKE50448,0:POKE50688,12
8                                         LN
•102 JY=PEEK(56321)AND15                  HM
•103 IFJY=7THENPOKE50447,1:POKE50448,0:PO
KE50688,128:RETURN                        JI
•104 IFJY=11THENPOKE50447,255:POKE50448,0
:POKE50688,128:RETURN                     PG
•106 IFJY=13THENPOKE50447,0:POKE50448,1:P
OKE50688,128:RETURN                       FO
•108 IFJY=14THENPOKE50447,0:POKE50448,255
:POKE50688,128:RETURN                     OB
•110 RETURN                               IM
•200 IFW1<191THEN300                      JC
•201 POKE50447,0:POKE50448,0:POKE50668,12
8:POKE50432,0                             NP
•202 FORX=STOS+24:POKEX,0:NEXT:POKES+24,1
5:POKES+5,8:POKES+6,255:POKES+4,21        CE
•203 F1=2:FORZ=1TO24:F2=80:POKES+1,F1:FOR
Y=1TO5:POKES+15,F2                        KL
•204 F2=F2/1.2:NEXTY:F1=F1+8:NEXTZ:POKES+
6,15                                      MK
•210 K=K+1:SC=SC+100                      GN
•211 IFK=4THENK=0:SC=SC+TM:TM=2500        DL
•212 PRINT"[HOME]"TAB(23);K;TAB(32);SC    MF
•215 GOSUB550:POKE50432,191:GOTO31        AF
•300 POKE50447,0:POKE50448,0:POKE50668,12
8:POKE50432,0:POKE2047,201                FF
•301 M=M-1:PRINT"[HOME]"TAB(15);M:GOSUB63
8                                         HD
•302 FORT=0TO8:FORX=2040TO2045:POKEX,197:
NEXTX                                     EH
•303 FORY=0TO50:NEXTY:FORX=2040TO2045:POK
EX,198:NEXTX:FORY=0TO50:NEXTY:NEXTT       MA
•305 IFM=0THEN400                         PO
•306 GOSUB550:POKE50432,191:GOTO31        AF
•400 POKE50447,0:POKE50448,0:POKE50668,12
8:POKE50432,63:POKEV+21,63                BA
•401 FORX=2040TO2045:POKEX,197:NEXT       KG
•402 PRINT"[CLEAR][9"[DOWN]"]"TAB(15)"GAM
E OVER":PRINT                             JK
•403 PRINTTAB(18)"SCORE ";SC:PRINT:PRINTT
AB(12)"PRESS Y TO PLAY AGAIN"             IJ
```

```
•404 GET JUNK$:IFJUNK$<>""THEN404             DH
•405 GETA$:IFA$=""THEN405                     HO
•406 IF A$="Y"THEN408                         JN
•407 END                                      IC
•408 POKEV+21,0:POKE50432,0:SC=0:TM=2500:
K=0:M=4:GOSUB500:GOSUB550:GOTO30              MP
•500 POKE53281,15:POKE53280,0                 JL
•501 PRINT"[CLEAR][BLUE] TIME";TM;TAB(12)
"MEN";M;TAB(19)"KEYS";K;TAB(27)"SCORE";S
C                                             AM
•502 PRINT"[WHITE][RVSON][39";"]"             EK
•503 PRINT"[RVSON];[RVSOFF][5" "][RVSON]7
8"TAB(22)"[RVSON]78"TAB(31)"[RVSON]78[RV
SOFF][5" "][RVSON];"                          GK
•504 PRINT"[RVSON];[RVSOFF][5" "][RVSON]9
:"TAB(22)"[RVSON]9:"TAB(31)"[RVSON]9:[RV
SOFF][5" "][RVSON];"                          JK
•505 PRINT"[RVSON];[RVSOFF][5" "][RVSON]7
8"TAB(31)"[RVSON]78[RVSOFF][5" "][RVSON]
;"                                            GO
•506 PRINT"[RVSON];[RVSOFF][5" "][RVSON]9
:"TAB(31)"[RVSON]9:[RVSOFF][5" "][RVSON]
;":PRINT"[RVSON];"TAB(38)"[RVSON];"           FJ
•507 PRINT"[RVSON];"TAB(13)"[RVSON]78"TAB
(38)"[RVSON];"                                BM
•508 PRINT"[RVSON];"TAB(13)"[RVSON]9:[RVS
OFF][5" "][RVSON][BLACK][3"@"]ABC"TAB(38
)"[RVSON][WHITE];"                            CO
•509 PRINT"[RVSON];"TAB(13)"[RVSON]78[RVS
OFF][5" "][RVSON][BLACK]@DEFGH"TAB(38)"[
RVSON][WHITE];"                               NC
•510 PRINT"[RVSON];"TAB(13)"[RVSON]9:[RVS
OFF][5" "][RVSON][BLACK]@IJKLM"TAB(38)"[
RVSON][WHITE];"                               CP
•511 PRINT"[RVSON];[RVSOFF][5" "][RVSON]7
8[RVSOFF][5" "][RVSON]78[RVSOFF][5" "][R
VSON][BLACK]NOP[RVSOFF] [RVSON]QR[RVSOFF
][5" "][RVSON][WHITE]78[RVSOFF][5" "][RV
SON];"                                        FF
•512 PRINT"[RVSON];[RVSOFF][5" "][RVSON]9
:[RVSOFF][5" "][RVSON]9:[RVSOFF][5" "][R
VSON][BLACK]STUVWX[RVSOFF][5" "][RVSON][
WHITE]9:[RVSOFF][5" "][RVSON];"               PJ
•513 PRINT"[RVSON];[RVSOFF][5" "][RVSON]7
8"TAB(20)"[RVSON][BLACK]@YZ[[EP]@[RVSOFF
][5" "][RVSON][WHITE]78[RVSOFF][5" "][RV
SON];"                                        HB
•514 PRINT"[RVSON];[RVSOFF][5" "][RVSON]9
:"TAB(20)"[RVSON][BLACK]@][UPARROW][BACK
ARROW] @[RVSOFF][5" "][RVSON][WHITE]9:[R
VSOFF][5" "][RVSON];"                         GG
•515 PRINT"[RVSON];"TAB(20)"[RVSON][BLACK
]!#$%&@[RVSOFF][5" "][RVSON][WHITE]78[RV
SOFF][5" "][RVSON];"                          HM
•516 PRINT"[RVSON];"TAB(20)"[RVSON][BLACK
]'()[3"@"][RVSOFF][5" "][RVSON][WHITE]9:
[RVSOFF][5" "][RVSON];"                       BG
•518 PRINT"[RVSON];"TAB(22)"[RVSON]78"TAB
(38)"[RVSON];"                                BK
•519 PRINT"[RVSON];"TAB(13)"[RVSON]78"TAB
(22)"[RVSON]9:"TAB(38)"[RVSON];"              EL
•520 PRINT"[RVSON];"TAB(13)"[RVSON]9:"TAB
(38)"[RVSON];"                                BA
•521 PRINT"[RVSON];[RVSOFF][5" "][RVSON]7
8[RVSOFF][5" "][RVSON]78"TAB(38)"[RVSON]
;"                                            OF
•522 PRINT"[RVSON];[RVSOFF][5" "][RVSON]9
:[RVSOFF][5" "][RVSON]9:"TAB(38)"[RVSON]
;"                                            PF
•523 PRINT"[RVSON];[RVSOFF][5" "][RVSON]7
8[RVSOFF][5" "][RVSON]78"TAB(31)"[RVSON]
78[RVSOFF][5" "][RVSON];"                     EH
•524 PRINT"[RVSON];[RVSOFF][5" "][RVSON]9
:[RVSOFF][5" "][RVSON]9:"TAB(31)"[RVSON]
9:[RVSOFF][5" "][RVSON];"                     FH
•525 FORX=56256TO56294:POKEX,1:NEXT:FORX=
1984TO2022:POKEX,187:NEXT                     KC
•526 RETURN                                   IM
•550 POKEV+28,128:POKEV+37,1:POKEV+38,9:P
OKEV+46,6:POKEV+45,2                          LK
•551 POKEV+39,2:POKEV+40,6:POKEV+41,5:POK
EV+42,8:POKEV+43,1:POKEV+44,0                 EP
•552 POKE2047,196:POKE2046,199:FORX=2040T
O2045:POKEX,200:NEXT                          PP
•554 POKEV+16,65:POKEV+12,45:POKEV+13,140
:POKEV+0,45:POKEV+1,190                       PJ
•555 POKEV+10,242:POKEV+11,66:POKEV+8,242
:POKEV+9,190                                  BP
•556 POKEV+6,152:POKEV+7,100:POKEV+4,96:P
OKEV+5,162                                    LP
•557 POKEV+2,40:POKEV+3,80:POKEV+14,40:PO
KEV+15,220                                    EK
•558 POKE50433,255:POKE50434,0:POKE50435,
1:POKE50436,0:POKE50437,0:POKE50438,254       AJ
•559 POKE50439,0:POKE50440,2:POKE50441,0:
POKE50442,255:POKE50443,0:POKE50444,2         HH
•560 POKE50447,0:POKE50448,0                  EJ
•562 RETURN                                   IM
•600 POKE53281,15:POKE53280,0:PRINT"[CLEA
R]"TAB(12)"[BLUE]JC HILTY PRESENTS"           IO
•602 PRINT:PRINTTAB(7)"[RVSON][RED][3"@"]
"TAB(27)"[RVSON][BLUE]5@6":PRINTTAB(7)"[
RVSON][RED]@@"TAB(26)"[RVSON][BLUE]*[3"@
"]+"                                          MH
•604 PRINTTAB(7)"[RVSON][RED]@[RVSOFF]  S
CAPE[6" "][RVSON][BLACK]56[RVSOFF][3" "]
[RVSON][BLUE]/[3"@"]0"                        CB
•606 PRINTTAB(7)"[RVSON][RED][3"@"]"TAB(2
0)"[RVSON][BLACK]*@@+[RVSOFF]  [RVSON],[
BLUE][3"@"][BLACK]-[BLUE].234"                LO
•608 PRINTTAB(20)"[RVSON][BLACK]/@@0,-.[B
LUE][3"@"][BLACK]@[BLUE][3"@"]234"            CL
•610 PRINTTAB(11)"[RVSON][RED][3"@"]"TAB(
21)"[RVSON][BLACK][6"@"][BLUE][3"@"][BLA
CK]@[BLUE][5"@"]2"                            IG
•612 PRINTTAB(11)"[RVSON][RED]@@"TAB(21)"
```

```
[RVSON][BLACK][3"@"]ABC[BLUE][3"@"][BLAC
K]@[BLUE][6"@"]"                        KN
·614 PRINTTAB(11)"[RVSON][RED]@[RVSOFF] R
OM[5" "][RVSON][BLACK]@DEFGH[BLUE][3"@"]
[BLACK]@[BLUE][6"@"]"                   EE
·616 PRINTTAB(11)"[RVSON][RED]@"TAB(21)"[
RVSON][BLACK]@IJKLM[BLUE][3"@"][BLACK]@[
BLUE][6"@"]"                            GG
·618 PRINTTAB(21)"[RVSON][BLACK]NOP[RVSOF
F] [RVSON]QR[BLUE][3"@"][BLACK]@[BLUE]@ DH
·620 PRINTTAB(6)"[RVSON][RED][3"@"]"TAB(2
1)"[RVSON][BLACK]STUVWX[BLUE][3"@"][BLAC
K]@[BLUE][6"@"]"                        PG
·622 PRINTTAB(6)"[RVSON][RED]@"TAB(21)"[R
VSON][BLACK]@YZ[[EP]@[BLUE][3"@"][BLACK]
@[BLUE][6"@"]"                          NM
·624 PRINTTAB(6)"[RVSON][RED][3"@"][RVSOF
F]KULL"TAB(21)"[RVSON][BLACK]@][UPARROW]
[BACKARROW] @[BLUE][3"@"][BLACK]@[BLUE][
6"@"]"                                  LD
·626 PRINTTAB(8)"[RVSON][RED]@"TAB(21)"[R
VSON][BLACK]!#$%&@[BLUE][3"@"][BLACK]@[B
LUE][6"@"]"                             MB
·628 PRINTTAB(6)"[RVSON][RED][3"@"]"TAB(2
1)"[RVSON][BLACK]'()[3"@"][BLUE][3"@"][B
LACK]@[BLUE][6"@"]"                     DD
·630 PRINTTAB(14)"[RVSON][RED]@[RVSOFF][4
" "][RVSON][PURPLE][6"@"][RVSOFF]WELCOME
[RVSON][7"@"]"                          HN
·632 PRINTTAB(5)"[RVSON][RED][3"@"][RVSOF
F][6" "][RVSON]@[RVSOFF][3" "][RVSON][PU
RPLE][21"@"]"                           MG
·634 PRINTTAB(5)"[RVSON][RED]@[RVSOFF]  A
STLE [RVSON]@":PRINTTAB(5)"[RVSON][RED]@
"                                       AN
·636 PRINTTAB(5)"[RVSON][RED][3"@"][RVSOF
F][6" "][RVSON]@[RVSOFF][BLUE]FEATURING
THE SKELETTES!"                         HK
·638 FORX=STOS+24:POKEX,0:NEXT:POKES+24,1
5:POKES+5,8:POKES+6,255:POKES+4,23      CK
·640 F2=5:FORT=1TO3:POKES+15,F2:FORF1=1TO
140:POKES+1,F1:F2=F2+.015               BG
·642 NEXTF1:NEXTT:POKES+6,15            JP
·670 RETURN                             IM
·700 CH=14336:RM=38912:POKE53272,(PEEK(53
272)AND240)OR14                         BN
·702 POKE56334,PEEK(56334)AND254:POKE1,PE
EK(1)AND251                             BE
·704 FORX=CHTOCH+503:POKEX,PEEK(X+RM):NEX
T                                       HI
·706 POKE1,PEEK(1)OR4:POKE56334,PEEK(5633
4)OR1                                   IE
·708 FORX=CH+8*128TOCH+8*161STEP8:FORJ=XT
OX+7:READA:POKEJ,A:NEXT:NEXT            AC
·710 FORX=CH+8*163TOCH+8*187STEP8:FORJ=XT
OX+7:READA:POKEJ,A:NEXT:NEXT            HP
·712 FORX=50880TO51116:READA:POKEX,A:NEXT ND
·714 FORX=49152TO49528:READA:POKEX,A:NEXT LP
·716 FORX=12544TO12926:READA:POKEX,A:NEXT NC
·718 RETURN                             IM
·999 REM    CHARACTER DATA              LG
·1000 DATA 255,255,255,255,255,255,255,25
5,255,255,255,255,252,240,192,128       NE
·1002 DATA 255,255,255,63,15,3,0,0,255,25
5,255,255,255,255,255,127               FM
·1004 DATA 252,252,240,192,195,135,143,31
,254,60,24,0,128,192,224,243            NM
·1006 DATA 0,3,15,63,63,63,15,3,252,254,2
55,255,255,255,254,252                  LH
·1008 DATA 63,15,7,7,7,15,15,31,31,31,31,
31,31,14,0,128                          KE
·1010 DATA 243,243,231,199,135,15,14,12,1
29,128,192,192,192,224,96,0             PN
·1012 DATA 240,0,7,63,255,31,0,0,31,127,2
55,255,255,255,63,15                    NK
·1014 DATA 255,255,255,255,252,252,248,24
9,128,240,195,7,14,60,240,248           EH
·1016 DATA 0,128,128,0,0,0,0,0,0,0,128,64
,32,56,120,126,15,7,3,1,1,1,1,3         EF
·1018 DATA 251,255,255,255,255,255,255,25
5,248,224,239,208,224,196,196,196       KC
·1020 DATA 12,51,192,145,145,147,155,191,
28,226,225,225,227,227,230,230          BP
·1022 DATA 127,255,255,255,255,255,223,20
7,3,199,255,255,255,255,255,255         AL
·1024 DATA 196,207,207,239,239,255,254,25
4,255,63,63,63,63,63,63,31              KE
·1026 DATA 231,231,247,247,255,255,255,25
5,207,199,195,195,195,131,135,135       JC
·1028 DATA 254,254,254,254,252,252,252,25
2,31,31,31,31,31,63,95,95               DH
·1030 DATA 255,255,255,255,255,253,252,25
2,135,135,135,135,135,135,7,7           ME
·1032 DATA 255,223,207,207,205,141,136,12
8,252,254,251,186,178,144,16,0          FE
·1034 DATA 94,158,12,12,8,0,0,0,224,224,6
4,64,0,1,7,127                          IH
·1036 DATA 15,15,31,255,255,255,255,255,1
28,128,128,128,128,131,135,159          KM
·1038 DATA 0,0,1,7,255,255,255,255,1,31,2
55,255,255,255,255,255                  GP
·1040 DATA 255,127,63,63,31,31,15,15,255,
254,252,252,248,248,240,240             NC
·1042 DATA 0,0,0,0,0,7,31,255,0,1,3,15,63
,255,255,255                            BH
·1044 DATA 63,255,255,255,255,255,255,255
,15,15,7,7,3,3,1,1                      JB
·1046 DATA 240,240,224,224,192,192,128,12
8,0,0,0,0,0,0,3,15                      BL
·1048 DATA 192,240,252,255,255,255,255,25
5,0,0,0,192,240,252,255,255             CD
·1050 DATA 0,0,0,0,0,0,192,224,3,7,15,31,
63,63,31,31                             OD
·1052 DATA 192,224,240,248,252,252,248,24
8,3,7,15,31,25,25,31,15                 MD
·1054 DATA 192,224,240,248,152,152,248,24
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0,6,3,3,6,12,24,48,96                          PO
•1056 DATA 96,192,192,96,48,24,12,6,255,1
53,189,255,102,60,60,24                        PG
•1060 REM INTERRUPT DATA                       LJ
•1062 DATA 169,255,45,0,198,240,16,169,0,
141,0,198,162,21,189,0                         HG
•1064 DATA 197,157,0,198,202,208,247,162,
1,169,1,141,80,197,173,80                      LE
•1066 DATA 197,45,0,197,240,3,76,243,198,
232,232,14,80,197,208,238,76,49,234            JP
•1068 DATA 169,0,29,0,197,208,3,76,97,199
,169,128,61                                    KE
•1070 DATA 0,197,240,48,254,0,198,208,40,
222,255,207,76,144,199,80                      DA
•1072 DATA 197,45,16,208,208,12,173,16,20
8,13,80,197,141,16,208,76                      OH
•1074 DATA 43,199,173,16,208,77,80,197,14
1,16,208,189,0,197,157,0                       HJ
•1076 DATA 198,76,97,199,222,0,198,208,40
,254,255,207,208,29,173,80                     OA
•1078 DATA 197,45,16,208,208,12,173,16,20
8,13,80,197,141,16,208,76                      OH
•1080 DATA 91,199,173,16,208,77,80,197,14
1,16,208,189,0,197,157,0                       CA
•1082 DATA 198,169,0,232,29,0,197,208,3,7
6,140,199,169,128,61,0                         BP
•1084 DATA 197,240,11,254,0,198,208,20,22
2,255,207,76,134,199,222,0                     FH
•1086 DATA 198,208,9,254,255,207,189,0,19
7,157,0,198,202,76,233,198                     OE
•1088 DATA 169,255,221,255,207,240,3,76,4
3,199,173,80,197,76,17,199                     BM
•1090 DATA 120,169,192,141,20,3,169,198,1
41,21,3,88,96                                  ED
•1092 REM    SCROLL DATA                       AE
•1094 DATA 174,114,193,224,3,144,3,76,117
,192,188,114,193,140,121,193,174               NH
•1096 DATA 118,193,232,202,32,30,193,172,
121,193,173,119,193,201,2,208,10               AM
•1098 DATA 169,32,72,173,33,208,72,76,50,
192,177,90,72,177,92,72,204                    CN
•1100 DATA 116,193,240,20,200,177,90,72,1
77,92,136,145,92,104,145,90,200                IK
•1102 DATA 204,116,193,208,238,240,18,136
,177,90,72,177,92,200,145,92,104               BH
•1104 DATA 145,90,136,204,115,193,208,238
,173,119,193,201,0,208,5,104,104               IC
•1106 DATA 76,111,192,104,145,92,104,145,
90,236,117,193,208,160,96,172,116              MH
•1108 DATA 193,200,189,114,193,170,32,30,
193,173,120,193,201,2,208,19,136               HM
•1110 DATA 169,32,153,122,193,173,33,208,
153,162,193,204,115,193,208,139,240            LC
•1112 DATA 16,136,177,90,153,122,193,177,
92,153,162,193,204,115,193,208,240             ND
•1114 DATA 236,117,193,240,37,202,32,30,1
93,172,116,193,200,136,177,90,72               DH
•1116 DATA 177,92,32,48,193,145,92,104,14
5,90,32,56,193,204,115,193,208                 DG
•1118 DATA 234,236,117,193,208,221,240,46
,202,206,118,193,232,32,30,193,172             OE
•1120 DATA 116,193,200,136,32,48,193,177,
90,72,177,92,32,56,193,145,92                  ME
•1122 DATA 104,145,90,204,115,193,208,234
,236,118,193,208,221,238,118,193,232           BG
•1124 DATA 32,30,193,173,120,193,201,0,24
0,20,172,115,193,136,200,185,162               JH
•1126 DATA 193,145,92,185,122,193,145,90,
204,116,193,208,240,96,189,89,193              GH
•1128 DATA 133,91,24,105,212,133,93,189,6
4,193,133,90,133,92,96,72,152                  KM
•1130 DATA 24,105,40,168,104,96,72,152,56
,233,40,168,104,96,0,40,80                     EO
•1132 DATA 120,160,200,240,24,64,104,144,
184,224,8,48,88,128,168,208,248                CC
•1134 DATA 32,72,112,152,192,4,4,4,4,4,4,
4,5,5,5,5,5                                    CO
•1136 DATA 5,6,6,6,6,6,6,6,7,7,7,7,7,0,2,
37,0,0,1,1                                     HA
•1138 REM SPRITE DATA                          MM
•1140 DATA 0,60,0,0,52,0,0,20,0,0,16,0,0,
40,0,0,40,64,0,170,128,2,170,0                 MD
•1142 DATA 1,40,0,0,60,0,0,42,128,3,40,12
8,15,160,192,0,0,240                           GI
•1144 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0                                  AO
•1146 DATA 0,0,0,0,0,0,0,0,0,60,0,0,255
,0,0,255,0,1,153,128,1,153,128                 CK
•1148 DATA 1,255,128,1,255,128,0,102,0,0,
102,28,56,255,240                              GB
•1150 DATA 5,60,16,14,102,0,0,103,128,0,1
93,128,0,192,192,1,128,192,1,128,192           GA
•1152 DATA 0,0,0,0                             PK
•1154 DATA 0,0,0,0,0,0,0,0,0,60,0,0,255
,0,0,255,0,1,153,128,113,153,156               IC
•1156 DATA 25,255,144,5,255,160,2,102,64,
1,102,128,0,255,0,0,60,0,0,102,0              GA
•1158 DATA 0,102,0,0,60,0,0,24,0,0,54,0,0
,54,0,0,0,0,0                                  KF
•1160 DATA 0,0,0,0,0,0,0,0,0,28,0,0,62,
0,0,54,0,0,62,0,0,8,0,0,12,0,0,12,0            JM
•1162 DATA 0,8,0,0,8,0,0,10,0,0,14,0,0,10
,0,0,8,0,0,0,0,0,0,0,0,0,0,0,0,0,0             AJ
•1164 DATA 0                                   NP
•1166 DATA 0,127,224,0,255,240,1,255,248,
3,255,252,3,24,252                             CP
•1168 DATA 3,24,252,3,24,248,3,255,240,3,
223,224,0,217,192                              LI
•1170 DATA 0,92,192,0,254,192,0,252,192,1
,249,192,0,3,192                               LB
•1172 DATA 0,175,0,1,254,0,1,252,0,3,248,
0,7,240,0,0,0,0,0                              IF
•1174 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,12                 FH
•1176 DATA 52,174,172,52,174,172,61,174,1
75,61,174,175                                  FE
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•1178 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0,0,0,0,0,0                                  OP
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NEBERGALL RUN

FROM PAGE 68

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•100 SOUND1,5000 , 500,0,1000 ,100  ,0,20
 48                                           DN
•110 PRINT"[CLEAR]":COLOR0,1:COLOR1,3:COL
 OR4,15:FORY=1TO12:CHAR1,14,13,"[RED]ALER
 T[3"."]ALERT",1:FORT=1TO163 :NEXTT           AB
•120 CHAR0,14,13,"[13" "]",0:FORT=1TO165:
 NEXTT:NEXTY                                  BL
•130 PRINT"[CLEAR]":PRINT"[6"[DOWN]"]":G$
 ="COMMANDER":GOSUB1650                       KE
•140 FORX=1TO500:NEXTX                        BC
•150 PRINT:PRINT: PRINT:G$="THE FORCES OF
  THE BLACK NEBULA":GOSUB1650                 LM
•160 PRINT:G$="HAVE BROKEN THROUGH THE PL
 ANETARY":GOSUB1650                           JK
•170 PRINT:G$="DEFENSE LINES AND ARE ATTA
 CKING":GOSUB1650                             NO
•180 PRINT:PRINT:G$="THE PLANET [c 6]NEBE
 RGALL":GOSUB1650:GOSUB1690                   IJ
•190 PRINT"[CLEAR]"                           HH
•200 PRINT:PRINT:PRINT:G$="[RED]WE HAVE G
 ATHERED THE WEAPONS":GOSUB1650               GM
•210 PRINT:G$="AND SUPPLIES THAT THEY NEE
 D TO":GOSUB1650                              CD
•220 PRINT:G$="SURVIVE THE ATTACK.":GOSUB
 1650                                         BP
•230 PRINT:G$="WE HAVE ARMED A SUPPLY SHI
 P WITH THE":GOSUB1650                        AK
•240 PRINT:G$="NEW STELLAR LASER MARK-IV.
 ":GOSUB1650                                  IO
•250 PRINT:PRINT:PRINT:G$="ENEMY TROOP SH
 IPS ARE PATROLING":GOSUB1650                 FN
•260 PRINT:G$="THE STELLAR SUPPLY LANES."
 :GOSUB1650                                   LE
•270 PRINT:PRINT:PRINT:G$="WE HAVE ONLY O
 NE LASER.":GOSUB1650                         BF
•280 PRINT:G$="YOU WILL HAVE TO DESTROY A
 S MANY":GOSUB1650                            PI
•290 PRINT:G$="OF THE TROOP SHIPS AS POSS
 IBLE, TO":GOSUB1650                          IL
•300 PRINT:G$="ENSURE THE SURVIVAL OF THE
  UNARMED":GOSUB1650                          GI
•310 PRINT:G$="SUPPLY SHIPS THAT WILL FOL
 LOW YOU.":GOSUB1650                          DA
•320 GOSUB1690:PRINT"[CLEAR]"                 CL
•330 PRINT:PRINT:G$="MISSING A TARGET WIL
 L CAUSE AN":GOSUB 1650                       CH
•340 PRINT:G$="IMBALANCE IN YOUR LASER TH
 AT COULD":GOSUB1650                          HK
•350 PRINT:G$="DESTROY YOU!":GOSUB1650        DB
•360 PRINT:PRINT:PRINT:G$="DON'T MISS[3"!
 "]":GOSUB1650                                EG
•370 FORX=1TO500:NEXTX                        BC
•380 PRINT:PRINT:PRINT:PRINT:G$="GOOD LUC
 K [3"!"]":GOSUB1650                          IN
•390 FORX=1TO2000:NEXTX:PRINT"[CLEAR]"        MI
•400 PRINT"[CLEAR][c 7][5"[DOWN]"]PLEASE
 ENTER EXPERIENCE LEVEL (1-9)";               GB
•405 GETKBD$:IFKBD$<>""THEN405                IJ
•410 GETKEY LV$                               GE
•420 IF LV$<"1"ORLV$>"9"THEN400               FF
•430 LV=(ASC(LV$)-48)                         LD
•440 M1=19-LV:H1=11+LV:G1=1450-LV*50          DF
•450 PRINT" ";LV$:SLEEP2                      IG
•460 PRINT:PRINT:PRINT"THANK YOU, COMMAND
 ER[3"."]":PRINT"PLEASE HIT YOUR FIRE BUT
 TON TO LAUNCH":PRINT"AGAIN, GOOD LUCK [3
 "!"]"                                        GM
•470 IF (JOY(2) AND 128) <>128THEN470         LE
•480 FAST                                     CF
•490 SOUND1,5000 , 500,0,1000 ,100  ,0,20
 48                                           DN
•500 COLOR0,1                                 HJ
•510 SPRCOLOR2,3                              JK
•520 GRAPHIC1,1                               GP
•530 COLLISION1,1310                          DF
•540 FORI=1TO8                                JD
•550 FORX=0TO66                               NC
•560 READA                                    MK
•570 B$=B$+CHR$(A)                            IB
•580 NEXTX                                    NK
•590 SPRSAVB$,I                               PG
•600 B$=""                                    FO
•610 NEXTI                                    MN
•620 SPRSAV8,W$:SPRSAV7,Y$:SPRSAV6,Z$:SPR
 SAV2,D$:SPRSAV3,E$:SPRSAV4,F$                GF
•630 DI=1:GOTO670                             MG
•640 SPRSAVD$,2:SPRSAVD$,3:SPRSAVD$,4:DI=
 2:RETURN                                     LA
•650 SPRSAVE$,2:SPRSAVE$,3:SPRSAVE$,4:DI=
 3:RETURN                                     MI
•660 SPRSAVF$,2:SPRSAVF$,3:SPRSAVF$,4:DI=
 1:RETURN                                     IN
•670 COLOR0,1:COLOR1,7:COLOR4,1:COLOR5,7      KN
•680 SPRITE2,1,6,0,0,0,1                      GP
•690 MOVSPR2,300,164                          KA
•700 MOVSPR2,270#1                            EE
•710 SPRITE3,1,7,0,0,0,1                      IJ
•720 MOVSPR3,200,100                          MM
•730 MOVSPR3,290#3                            EJ
•740 SPRITE5,1,16,0,0,0,0                     MM
•750 MOVSPR5,200,100                          LC
•760 MOVSPR5,60#5                             CN
•770 SPRITE4,1,8,0,0,0,1                      GL
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•780 MOVSPR4,200,75                        HN
•790 MOVSPR4,315#4                         FN
•800 SPRITE1,1,6,0,0,0,0                   HF
•810 MOVSPR1,172,140                       NI
•820 FORS=1TO30                            LF
•830 CHAR1,INT(RND(1)*40),INT(RND(1)*25),
 "."                                       JH
•840 NEXTS                                 NH
•850 SLOW                                  CE
•860 GOSUB1480                             GC
•870 DO WHILE CN<150                       MH
•880 ON DI GOSUB 640,650,660               PD
•890 CN=CN+1                               LM
•900 J=0                                   DH
•910 J=JOY(2):CS=4                         AP
•920 IF(JAND128)=128THENJ=J-128:MC=MC+1:G
 OSUB1150:SPRITE1,1:GOSUB1050              FG
•930 IFMC=M1THENGOTO1490                   GO
•940 IFHT=H1THENGOTO1530                   FG
•950 IFGN>G1THENGOTO1600                   EL
•960 IFJ=0THENCS=0                         OA
•970 J=J-1                                 CA
•980 A=J*45:MOVSPR1,A#CS                   PJ
•990 X1=RSPPOS(1,0):Y1=RSPPOS(1,1)         BM
•1000 IFX1>400THENMOVSPR1,344,Y1:GOTO980   CA
•1010 IFX1>344THENMOVSPR1,X1-344,Y1        PE
•1020 LOOP                                 OO
•1030 GOSUB 1050                           FJ
•1040 GN=GN+CN:CN=0:GOTO870                EM
•1050 MOVSPR5,INT(RND(1)*360)#4            DF
•1060 MOVSPR2,INT(RND(1)*360)#3            BL
•1070 MOVSPR3,INT(RND(1)*360)#2            FN
•1080 MOVSPR4,INT(RND(1)*360)#3            HF
•1090 SPRITE1,1,6,0,0,0,0                  HF
•1100 SPRITE2,1,6,0,0,0,1                  GP
•1110 SPRITE3,1,7,0,0,0,1                  IJ
•1120 SPRITE5,1,13,0,0,0,0                 LD
•1130 SPRITE4,1,8,0,0,0,1                  GL
•1140 RETURN                               IM
•1150 X1=RSPPOS(1,0):Y1=RSPPOS(1,1)        BM
•1160 FX=X1-12:IFFX<0THENFX=512+FX         CH
•1170 FY=Y1-40:IFFY<0THENFY=256+FY         EG
•1180 Y=250:X=172                          JJ
•1190 SOUND 1,7800,15,0,1000,300,2,600     JD
•1200 DRAW1,X,YTOFX,FY                     EB
•1210 DRAW0,X,YTOFX,FY                     DE
•1220 MOVSPR8,X1,Y1                        LI
•1230 SPRITE1,0                            JH
•1240 SPRITE8,1,9,0,0,0,1                  LO
•1250 SOUND 1,3800,20,1,1000,200,3,600     KC
•1260 SPRITE8,1,3,0,0,0,0:FORR=1TO10:NEXT
 R                                         KP
•1270 SPRSAVY$,8:FORR=1TO10:NEXTR          PN
•1280 SPRSAVZ$,8                           PP
•1290 FORR=1TO50:NEXTR                     ML
•1300 SPRITE8,0:SPRSAVW$,8:RETURN          KA
•1310 IFBUMP(1)=0THENRETURN                PC
•1320 B=PEEK(53278)                        CE
•1330 IFB=0THENRETURN                      OM
•1340 SPRITE8,0                            KG
•1350 IFB=144THENE=5:S=500:GOTO1400        PN
•1360 IFB=136THENE=4:S=150:GOTO1400        DG
•1370 IFB=132THENE=3:S=100:GOTO1400        KM
•1380 IFB=130THENE=2:S=50:GOTO1400         IN
•1390 RETURN                               IM
•1400 MOVSPRE,0#0                          AI
•1410 SOUND2,1000,90,1,10,10,3,0           IK
•1420 SPRITE E,0,3,0,0,0,0                 IH
•1430 SCNCLR0:GRAPHIC0:FORF=1TO8:COLOR0,3
 :SPRITEE,1,8:FORTM=1TO25:NEXTTM:COLOR0,8
 :SPRITEE,1,3:FORTM=1TO25:NEXTTM:NEXTF:CO
 LOR0,1:GRAPHIC1:SPRITEE,0                 OK
•1440 MOVSPRE,344,150                      NC
•1450 SC=SC+S:GOSUB1480:MC=MC-1:HT=HT+1    DA
•1460 SPRITE1,1,6,0,0,0,0                  HF
•1470 POKE58,5:POKE57,20:RETURN            BE
•1480 CHAR1,0,0,"SCORE:"+STR$(SC)+" ",1:R
 ETURN                                     LK
•1490 POKE53269,0:GRAPHIC0,1:COLLISION1:G
 $="[RED]OOPS..ONE MISS TOO MANY..YOU DIE
 D":PRINT:PRINT:PRINT:GOSUB1650            OP
•1500 PRINT:PRINT:PRINT:G$="[GREEN]G A M
 E  O V E R":GOSUB1650                     PK
•1510 PRINT:PRINT:G$=STR$(SC)+" - ENEMY T
 ROOPS DESTROYED":GOSUB1650                GG
•1520 PRINT:PRINT:PRINT:G$="[BLUE]HIT ANY
  KEY TO PLAY AGAIN":GOSUB1650:GETKEYA$:C
 LR:RUN400                                 DP
•1530 POKE53269,0:GRAPHIC0,1:COLLISION1:G
 $="[RED]CONGRATULATIONS COMMANDER !!":GO
 SUB1650                                   HA
•1540 PRINT:PRINT:G$="YOU HAVE ENSURED TH
 E SAFTY OF":GOSUB1650                     LK
•1550 PRINT:G$="THE OTHER SUPPLY SHIPS AN
 D HAVE":GOSUB1650                         NL
•1560 PRINT:G$="GIVEN THE PEOPLE OF NEBER
 GALL A":GOSUB1650                         HM
•1570 PRINT:PRINT:G$="[WHITE]FIGHTING CHA
 NCE":GOSUB1650                            DC
•1580 PRINT:PRINT:G$=STR$(SC)+"[GREEN] -
 ENEMY TROOPS DESTROYED":GOSUB1650         MM
•1590 PRINT:PRINT:PRINT:G$="[BLUE]HIT ANY
  KEY TO PLAY AGAIN":GOSUB1650:GETKEYA$:C
 LR:RUN400                                 DP
•1600 POKE53269,0:GRAPHIC0,1:COLLISION1:G
 $="[RED]TOO MANY DRONES GOT THROUGH":GOS
 UB1650                                    IM
•1610 PRINT:PRINT:G$="MISSION ABORTED":GO
 SUB1650                                   MI
•1620 PRINT:PRINT:PRINT:G$="[GREEN]G A M
 E  O V E R":GOSUB1650                     PK
•1630 PRINT:PRINT:G$=STR$(SC)+" - ENEMY T
 ROOPS DESTROYED":GOSUB1650                GG
•1640 PRINT:PRINT:PRINT:G$="[BLUE]HIT ANY
  KEY TO PLAY AGAIN":GOSUB1650:GETKEYA$:C
 LR:RUN400                                 DP
```

```
•1650 G=LEN(G$):IFG/2<>INT(G/2)THENG$=" "
 +G$:GOTO1650                                LP
•1660 FORP=1TOG/2:PRINTTAB(21-P);LEFT$(G$
 ,P);RIGHT$(G$,P):PRINT"[UP]";               BN
•1670 SOUND 1,25535,1                        II
•1680 FORW=1TO 8:NEXTW:NEXTP:RETURN          KA
•1690 GET KBD$:IFKBD$<>""THEN1690            LA
•1700 CHAR 1,0,24,CHR$(158)+"  ADDITIONAL
  TEXT FOLLOWS, HIT ANY KEY "+CHR$(157)+C
 HR$(148)+CHR$(32)+CHR$(28),1:GETKEY H$      PH
•1710 RETURN                                 IM
•1720 DATA 0,24,0,0,24,0,0,24,0,192,24,3,
 48,24,12,12,24,48,11,0,208                  KI
•1730 DATA 8,129,16,8,129,16,8,129,16,8,1
 29,16,11,0,208,12,24,48,48,24,12            PE
•1740 DATA 192,24,3,0,24,0,0,24,0,0,24,0,
 0,24,0,0,0,0,0,0,0,23,0,20,0                KG
•1750 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0,255,0,2,170,128                           FF
•1760 DATA 5,85,80,255,255,255,40,162,138
 ,40,162,138,255,255,255,5,85,80,2,170,12
 8                                           LP
•1770 DATA 0,255,0,0,0,0,0,0,0,0,0,0,0,0,
 0,0,0,0,0,0,0,23,0,20,0                     NC
•1780 DATA 0,0,0,0,0,0,0,0,0,0,20,0,0,0,0
 ,0,255,0,2,170,128                          GM
•1790 DATA 5,85,80,255,255,255,138,40,162
 ,138,40,162,255,255,255,5,85,80,2,170,12
 8                                           PP
•1800 DATA 0,255,0,0,0,0,0,20,0,0,0,0,0,0
 ,0,0,0,0,0,0,0,23,0,20,0                    AB
•1810 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0,255,0,2,170,128                           FF
•1820 DATA 5,85,80,255,255,255,162,138,40
 ,162,138,40,255,255,255,5,85,80,2,170,12
 8                                           DF
•1830 DATA 0,255,0,0,0,0,0,0,0,0,0,0,0,0,
 0,0,0,0,0,0,0,23,0,20,0                     NC
•1840 DATA 0,0,0,2,1,0,1,2,0,0,132,0,0,72
 ,0,0,48,0,64,120,8                          FP
•1850 DATA 32,252,16,17,254,32,11,135,64,
 7,255,128,6,170,128,11,255,64,17,134,32     MJ
•1860 DATA 32,252,16,64,120,8,0,48,0,0,72
 ,0,0,132,0,1,2,0,2,1,0,23,0,20,0            JO
•1870 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0,12,0,0,19,192                             BM
•1880 DATA 0,207,16,3,51,192,0,12,240,0,1
 15,192,0,207,48,0,243,48,0,15,208           PH
•1890 DATA 0,17,192,0,15,0,0,0,0,0,0,0,0,
 0,0,0,0,0,0,0,0,23,0,20,0                   NJ
•1900 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0,0,0,0,0,0                                 DH
•1910 DATA 0,15,0,0,49,64,0,12,192,0,55,6
 4,0,15,48,0,51,64,0,15,192                  AL
•1920 DATA 0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0,0,0,0,0,0,23,0,20,0                       AG
•1930 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0,0,0,0,0,0                                 DH
•1940 DATA 0,0,0,0,3,0,0,12,192,0,13,192,
 0,15,0,0,3,192,0,0,0                        LN
•1950 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0,0,0,0,0,0,23,0,20,0                       AH
```

WORDCOUNT
FROM PAGE 30

```
•5 PRINT"[CLEAR]":IFDS$=""THEN15:REM WORD
COUNT - BERT HALVERSON                        KG
•10 FAST:TRAP190:WINDOW0,0,79,24:TRAP210      IG
•15 GOSUB95                                   AG
•20 GET#2,C$:IFSTTHEN80                       BG
•25 L=ASC(C$)                                 IB
•30 IFL<DTHEN20                               OI
•35 IFL>57THENIFL<65THEN20                    IN
•40 IFL>UTHEN20                               PP
•45 GET#2,C$:IFSTTHENW=W+N:GOTO80             BK
•50 GETI$:IFI$THENPRINTW:GOSUB200:PRINT"[
UP][UP]":REM COUNT DEMAND                     KE
•55 L=ASC(C$)                                 IB
•60 IFL=39THEN45:REM*APOSTROPHE=A CHARACT
ER                                            DH
•65 IFL<DTHENW=W+N:GOTO20                     OO
•70 IFL>UTHENW=W+N:GOTO20                     DB
•75 GOTO45                                    PP
•80 PRINT"[10" "][UP][UP]"R$TAB(13)"[RVSO
N][c O] FINISHED [c O]"                       PJ
•85 PRINTTAB(13)"[DOWN]WORDS ="W:CLOSE2:C
LOSE1:GOSUB215:IFSTHENSLOW                    HC
•90 END                                       IC
•95 C$="":L=0:D=0:U=0:W=0:N=1:X=0:E=0:R$=
CHR$(13):E$="":YN$=""                         NG
•100 PRINTTAB(13)"[RVSON][c U] WORDCOUNT
[c U]"                                        IJ
•105 PRINT"[DOWN][DOWN]"                      PN
•110 INPUT"FILE NAME";FL$                     BP
•115 OPEN1,8,15:OPEN2,8,2,"0:"+FL$+",SEQ,
R"                                            OH
•120 INPUT#1,E,E$:IFE=0THEN135                PE
•125 PRINT"[CLEAR][DOWN][DOWN]ERROR"E"--
"E$:CLOSE2:CLOSE1:GOSUB215:IFSTHENSLOW        FD
•130 END                                      IC
•135 PRINT"COUNT NUMBERS AS WORDS? Y ";:I
NPUT"[4"[LEFT]"]";YN$                         OA
•140 IFYN$<>"Y"ANDYN$<>"N"THENPRINT"[UP][
UP]";:GOTO135                                 NO
•145 PRINT:IFYN$="N"THEN160                   NL
•150 D=48:U=218:REM*A-9. COUNTS NUMBERS T
OO                                            MG
•155 GOTO165                                  CK
•160 D=65:U=218:REM*A-Z. WILL COUNT LETTE
```

```
RS ONLY.                                    HA
•165 PRINT"[DOWN]PRESS ANY PRINTABLE KEY
FOR COUNT"R$"RUN/STOP KEY EXITS PROGRAM" LF
•170 PRINT"[DOWN][DOWN]COUNTING[3"."][DOW
N][DOWN]":GOSUB200                       OM
•175 RETURN                              IM
•180 :                                   DI
•185 REM SUBROUTINES                     PJ
•190 S=40:PRINT"[UP][RVSON]* SCREEN BLANK
S FOR CERTAIN OPERATIONS *[DOWN]"        HF
•195 SLOW:RESUMENEXT                     LM
•200 IFSTHENSLOW:SLEEP1:FAST             JI
•205 RETURN:REM 40-COL FAST SCREEN?      NI
•210 PRINTERR$(ER)" IN LINE"EL:CLOSE2:CLO
SE1:PRINTCHR$(7);:SLOW:END               BL
•215 PRINTCHR$(7);:RETURN:REM  BELL (128
MODE)                                    OL
```

WHAT'S UP, DOS?

FROM PAGE 73

FROM PAGE 73

CADET'S C-128 DOS

```
•1 SCNCLR                                 OK
•2 WINDOW 1,0,39,16                       NK
•3 SCNCLR                                 OK
•4 PRINT"[37"*"]"                         KG
•5 PRINT"*[35" "]*"                       IN
•6 PRINT"*[9" "]CADET'S C-128 DOS[9" "]*" LG
•7 PRINT"*[35" "]*"                       IN
•8 PRINT"[37"*"]":PRINT                   HM
•10 PRINTTAB(3);"A",TAB(4)"ACCESS DIRECTO
RY"                                       EG
•20 PRINTTAB(3);"B",TAB(4)"BACKUP FILES"  BJ
•30 PRINTTAB(3);"C",TAB(4)"CONSOLIDATE FI
LES"                                      PI
•40 PRINTTAB(3);"D",TAB(4)"DELETE FILES"  AA
•50 PRINTTAB(3);"E",TAB(4)"EXIT TO BASIC" DI
•60 PRINTTAB(3);"F",TAB(4)"FORMAT DISK"   FA
•70 PRINTTAB(3);"G",TAB(4)"GIVE FILE A NE
W NAME"                                   ED
•85 WINDOW 1,16,39,18                     AP
•90 PRINT"ENTER LETTER SIGNIFYING YOUR CH
OICE"                                     DM
•99 INPUT"WHAT IS YOUR REQUEST";X$        PD
•110 IF X$="A" THEN GOSUB 200             AP
•120 IF X$="B" THEN GOSUB 300             BN
•130 IF X$="C" THEN GOSUB 400             BD
•140 IF X$="D" THEN GOSUB 500             BB
•150 IF X$="F" THEN GOSUB 700             BF
•160 IF X$="G" THEN GOSUB 800             BL
•190 IF X$="E" THEN GOSUB 1000            ED
•198 GOSUB 600                            CG
•199 GOTO 2                               LP
•200 REM ACCESS DIRECTORY                 BD
•210 WINDOW 0,0,39,24:SCNCLR              OD
•220 WINDOW 5,3,39,24                     AK
•230 DIRECTORY                            OM
•240 CLOSE 1:PRINT:PRINT"HIT A KEY TO RET
URN TO MENU"                              ME
•250 GET Q$:IFQ$=""THEN 250               JK
•260 RETURN                               IM
•300 REM BACKUP FILE                      HC
•310 GOSUB 2000                           FL
•320 OPEN 15,8,15,"C:"+NF$+"="+SF$        LA
•330 CLOSE 15:RETURN                      NA
•400 REM VALIDATE DISK                    AM
•410 WINDOW 1,20,39,24:SCNCLR             EG
•420 PRINT "WARNING:OPEN FILES WILL BE DE
LETED."                                   NK
•430 PRINT"HIT Y TO VALIDATE.":INPUT"CONT
INUE";Q$                                  OI
•440 IF Q$<>"Y" THEN RETURN               FG
•450 OPEN 1,8,15,"V0"                     LH
•460 CLOSE 1:RETURN                       JG
•500 REM ERASE FILE                       CF
•510 WINDOW 1,20,39,24:SCNCLR             EG
•520 INPUT "WHAT FILES TO DELETE";FI$     CO
•530 INPUT"DO YOU WISH TO CONTINUE";X$    JJ
•540 IF X$<>"Y"THEN RETURN                EP
•550 SCRATCH""+FI$                        IA
•560 RETURN                               IM
•600 REM DISPLAY ERROR STATUS             HE
•610 WINDOW 1,20,39,24:SCNCLR             EG
•620 OPEN 15,8,15                         AM
•630 INPUT#15,A$,B$,C$,D$                 CN
•640 PRINT"ERROR STATUS:[SS][SS]"B$:PRINT
"ERROR NUMBER:[SS][SS]"A$                 PA
•670 CLOSE 15:RETURN                      NA
•700 REM FORMAT DISK                      KC
•710 WINDOW 1,20,39,24:SCNCLR             EG
•720 PRINT"INSERT DISK TO FORMAT"         HL
•730 PRINT"ENTER DISK NAME":INPUT DISK$   AJ
•740 PRINT"ENTER EXTENDER NAME":INPUT ID$ GA
•750 OPEN15,8,15,"N0:"+DISK$+","+ID$:CLOS
E15                                       NK
•760 RETURN                               IM
•800 REM GIVE FILE NEW NAME               CA
•810 GOSUB 2000                           FL
•820 OPEN 15,8,15,"R:"+NF$+"="+SF$        PL
•830 CLOSE 15:RETURN                      NA
•1000 REM RETURN TO BASIC                 HO
•1010 WINDOW 0,0,39,24:SCNCLR             OD
•1020 PRINT "TO ERASE WEDGE FROM MEMORY T
YPE NEW."                                 AO
•1030 PRINT"TO RETURN TO PROGRAM TYPE RUN
"                                         AC
•1099 END                                 IC
•2000 REM INPUT ROUTINE                   EB
•2010 WINDOW 1,20,39,24:SCNCLR            EG
•2020 INPUT"WHAT SOURCE FILE";SF$         EJ
•2030 PRINT:INPUT "WHAT IS NEW FILE NAME"
;NF$                                      CA
•2040 SCNCLR                              OK
•2050 RETURN                              IM
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81-83 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

CADET'S C-64 DOS

```
·1 PRINT"[CLEAR]"                                   HH
·2 PRINT"[37"*"]"                                   KG
·3 PRINT"*[35" "]*"                                 IN
·4 PRINT"*[10" "]CADET'S C-64 DOS[9" "]*"           KI
·5 PRINT"*[35" "]*"                                 IN
·6 PRINT"[37"*"]":PRINT                             HM
·10 PRINTTAB(3);"A",TAB(4)"ACCESS DIRECTO
RY"                                                 EG
·20 PRINTTAB(3);"B",TAB(4)"BACKUP FILES"            BJ
·30 PRINTTAB(3);"C",TAB(4)"CONSOLIDATE FI
LES"                                                PI
·40 PRINTTAB(3);"D",TAB(4)"DELETE FILES"            AA
·50 PRINTTAB(3);"E",TAB(4)"ERROR STATUS"            JH
·60 PRINTTAB(3);"F",TAB(4)"FORMAT DISK"             FA
·70 PRINTTAB(3);"G",TAB(4)"GIVE FILE A NE
W NAME"                                             ED
·80 PRINTTAB(3);"X",TAB(4)"EXIT TO BASIC"
:PRINT                                              KN
·90 PRINT"ENTER LETTER SIGNIFYING YOUR CH
OICE"                                               DM
·99 INPUT"WHAT IS YOUR REQUEST";X$                  PD
·100 PRINT"[CLEAR]"                                 HH
·110 IF X$="A" THEN GOSUB 200                       AP
·120 IF X$="B" THEN GOSUB 300                       BN
·130 IF X$="C" THEN GOSUB 400                       BD
·140 IF X$="D" THEN GOSUB 500                       BB
·150 IF X$="E" THEN GOSUB 600                       AH
·155 IF X$="F" THEN GOSUB 700                       BF
·160 IF X$="G" THEN GOSUB 800                       BL
·190 IF X$="X" THEN GOSUB 1000                      EO
·199 GOTO 1                                         LM
·200 REM ACCESS DIRECTORY                           BD
·252 OPEN 1,8,0,"$"                                 CG
·253 GET#1,A$,B$                                    AK
·254 GET#1,A$,B$                                    AK
·255 GET#1,A$,B$                                    AK
·258 C=0:IF A$<>""THEN C=ASC(A$)                    EO
·260 IF B$<>""THEN C=C+ASC(B$)*256                  AA
·262 PRINT MID$(STR$(C),2);TAB(3);                  MC
·264 GET#1,B$:IF ST<>0 THEN 282                     OE
·266 IF B$<> CHR$(34) THEN 264                      BF
·268 GET #1,B$:IF B$<> CHR$(34) THEN PRIN
T TAB(8);B$;:GOTO 268                               DB
·270 GET #1,B$:IF B$=CHR$(32) THEN 270              DE
·272 PRINT TAB(28);:C$=""                           LM
·274 C$=C$+B$:GET #1,B$:IF B$<>"" THEN 27
4                                                   KF
·276 PRINT LEFT$(C$,3)                              IP
·280 IF ST=0 THEN254                                FE
·282 PRINT " BLOCKS FREE "                          CH
·284 CLOSE 1:PRINT:PRINT"HIT A KEY TO RET
URN TO MENU"                                        ME
·290 GET X$:IFX$=""THEN 290                         JE
·295 RETURN                                         IM
·300 REM BACKUP FILE                                HC
·310 GOSUB 2000                                     FL
·320 OPEN 15,8,15,"C:"+NF$+"="+SF$                  LA
·330 CLOSE 15:RETURN                                NA
·400 REM VALIDATE DISK                              AM
·410 PRINT "WARNING:OPEN FILES WILL BE DE
LETED."                                             NK
·420 PRINT"HIT Y TO VALIDATE.":INPUT"CONT
INUE";Q$                                            OI
·430 IF Q$<>"Y" THEN RETURN                         FG
·440 OPEN 1,8,15,"V0"                               LH
·450 CLOSE 1:RETURN                                 JG
·500 REM ERASE FILE                                 CF
·510 INPUT "WHAT FILES TO DELETE";FI$               CO
·520 INPUT"DO YOU WISH TO CONTINUE";X$              JJ
·530 IF X$<>"Y"THEN RETURN                          EP
·540 OPEN 15,8,15,"S0:"+FI$                         IN
·550 CLOSE 15:RETURN                                NA
·600 REM DISPLAY ERROR STATUS                       HE
·610 OPEN 15,8,15                                   AM
·620 INPUT#15,A$,B$,C$,D$                           CN
·630 PRINT "ERROR STATUS:[SS][SS]"B$:PRIN
T:PRINT "ERROR NUMBER:[SS][SS]"A$                   CK
·640 PRINT:PRINT"HIT A KEY TO RETURN TO M
ENU"                                                EP
·650 GET X$:IF X$=""THEN 650                        JM
·660 CLOSE 15:RETURN                                NA
·700 REM FORMAT DISK                                KC
·710 PRINT "INSERT DISK TO FORMAT"                  HL
·720 PRINT "ENTER DISK NAME":INPUT DISK$            AJ
·730 PRINT:PRINT "ENTER EXTENDER NAME":IN
PUT ID$                                             FM
·740 PRINT"PUT DISK TO BE ERASED IN DRIVE
.":PRINT"PRESS Y TO CONTINUE. ";                    KP
·750 INPUT"CONTINUE";Q$:IF Q$<>"Y" THEN R
ETURN                                               FK
·760 OPEN 15,8,15,"N0:"+DISK$+","+ID$               LA
·770 CLOSE 15:RETURN                                NA
·800 REM GIVE FILE NEW NAME                         CA
·810 GOSUB 2000                                     FL
·820 OPEN 15,8,15,"R:"+NF$+"="+SF$                  PL
·830 CLOSE 15:RETURN                                NA
·1000 REM RETURN TO BASIC                           HO
·1010 PRINT "TO ERASE WEDGE FROM MEMORY T
YPE NEW."                                           AO
·1020 PRINT"TO RETURN TO PROGRAM TYPE RUN
"                                                   AC
·1099 END                                           IC
·2000 REM INPUT ROUTINE                             EB
·2010 INPUT"WHAT SOURCE FILE";SF$                   EJ
·2020 PRINT:INPUT "WHAT IS NEW FILE NAME"
;NF$                                                CA
·2030 RETURN                                        IM
```

COMMODARES
FROM PAGE 77

SOUND CHALLENGE

```
·1 REM COMMODARES PROBLEM #27-2:           KI
·2 REM   SOUND CHALLENGE                   IA
·5 REM                                     JD
·6 GOTO 200                                BO
·9 REM - "FROGGY" BY WILL LUDWIGSEN        FJ
·10 D=16:A=54272:POKE A+24,15:POKE A+6,0   HF
·11 POKE A+1,100:POKE A+5,2                PG
·12 IF(PEEK(162)AND D)=D THEN POKE A+4,33  EI
·13 POKE A+4,0:GOSUB 290 :GOTO 12          KD
·18 REM                                    JD
·19 REM - "KEY CLICKS" BY RON WEINER       GD
·20 FOR I=0 TO 15:POKE 54272+I,0:NEXT      LL
·21 PRINT"[CLEAR]PRESS KEYS; PRESS [RETUR
 N] TO END                                 GD
·22 GET A$:IF A$="" THEN 22                KB
·23 IF A$=CHR$(13) THEN 200                LL
·24 POKE 54296,15:POKE 54296,0             HP
·25 PRINT A$; : GOTO 22                    OJ
·28 REM                                    JD
·29 REM - "WAVES" BY ERNEST BARKMAN        FP
·30 S=54272:Y=INT(RND(1)*3)+1:IF Y=1 THEN
 X=131                                     LC
·31 POKE S,X:POKE S+1,X:POKE S+24,X        HA
·32 IF Y=2 THEN X=133                      HH
·33 IF Y=3 THEN X=135                      JA
·34 POKE S+6,X-1:POKE S+4,X:Q=INT(RND(1)*
 600)+500                                  IA
·35 FOR Z=1 TO Q:NEXT:GOSUB 290 :GOTO 30   BK
·38 REM                                    JD
·39 REM - "GALLOP" BY BOB SNADER           IJ
·40 S=54296:FOR T=0 TO 10:FOR J=5 TO 15 S
 TEP 5:POKE S,J:POKE S,0                   PJ
·41 FOR D=0 TO 60:NEXT:NEXT:FOR D=0 TO 10
 0:NEXT:NEXT                               IL
·42 GOSUB 290 : GOTO 40                    NA
·48 REM                                    JD
·49 REM - "SCANNER" BY BOB SNADER          KB
·50 A$="AHOY! COMMODARES":FOR T=1 TO 16    NK
·51 PRINT MID$(A$,T,1);CHR$(18);CHR$(32);
 CHR$(146);CHR$(157);                      KI
·52 POKE 54296,15:POKE 54296,0             HP
·53 FOR D=0TO40:NEXT:NEXT:PRINT CHR$(32)   MM
·54 PRINT:GOSUB 290:GOTO 50                HM
·58 REM                                    JD
·59 REM - "BUZZER" BY BOB SNADER           CC
·60 FOR T=0 TO 20 : POKE 54296,15:POKE 54
 296,0:NEXT:FOR P=1 TO 500:NEXT            DK
·61 GOSUB 290 : GOTO 60                    NG
·68 REM                                    JD
·69 REM - "AIR FLEET" BY JIM SPEERS        DF
·70 S=54272:RESTORE:FOR I=0 TO 24:READ Q:
 POKE I+S,Q:NEXT I                         IB
·71 DATA 142,6,0,0,33,15,255,125,6,0,0,33
 ,15,255,88,3,0,0,33,15,255,0,0,240,15     ID
·72 FOR I=4 TO 18 STEP 7:POKE S+I,0 :NEXT  LD
·73 FOR I=4 TO 18 STEP 7:POKE S+I,33:NEXT
 : GOSUB 290 : GOTO 73                     EP
·78 REM                                    JD
·79 REM - "COMPUTER!" BY DAVID PALO        BI
·80 S=54272:C=1024:POKE S+6,255:POKE S+24
 ,15:POKE S+4,17:PRINT"[CLEAR]"            HP
·81 POKE S+1,256*RND(8):D=32:IF RND(8)<.5
 THEN D=81                                 LP
·82 POKE S+C+1000*RND(8),16*RND(8):POKE C
 +1000*RND(8),D:GOSUB 290:GOTO 81          FM
·88 REM                                    JD
·89 REM - "R2-D2" BY KAREN MIDDAUGH        GH
·90 S=54272:PRINT"R2-D2"                   FC
·91 R=RND(1)*5+10:FOR I=1 TO R             GH
·92 DR=INT(15*RND(1)+1)                    JJ
·93 N1=INT(20*RND(1)+26)                   NF
·94 N2=INT(150*RND(1)+50)                  NI
·95 POKE S+2,0:POKE S+3,0:POKE S+5,136     BH
·96 POKE S+6,129:POKE S+1,N1:POKE S,N2     KH
·97 POKE S+4,20:POKE S+24,15               DM
·98 FOR T=1 TO DR:NEXT:POKE S+4,19:NEXT    MB
·99 POKE S+4,20 : GOSUB 290 : GOTO 91      OD
·108 REM                                   JD
·109 REM "SWEEPS & LEAPS" BY JOHN PRAGER   HN
·110 INPUT"HOP VALUE (25-55)";H:IF H<2 TH
 EN 110                                    NK
·111 S=54272:POKE S+24,15:A$="560143"      PK
·112 FOR J=1 TO LEN(A$):POKE S+VAL(MID$(A
 $,J,1)),69:NEXT                           EO
·113 X=X+RND(1)*H:X=X AND 255              HB
·114 POKE S+1,X:POKE S,X:GOSUB 290:GOTO 1
 13                                        DH
·180 REM                                   JD
·190 REM << MENU ROUTINE >>                GL
·200 PRINT"[CLEAR][3" "]SELECT SOUNDS 0 T
 HROUGH 9"                                 HI
·210 PRINT:PRINT"<0> - FROGGY","<1> - KEY
 CLICKS","<2> - WAVES ",                   JN
·220 PRINT"<3> - GALLOP","<4> - SCANNER",
 "<5> - BUZZER",                           OF
·230 PRINT"<6> - AIRFLEET","<7> - COMPUTE
 R!","<8> - R2-D2","<9> - SWEEPS & LEAPS"  KK
·240 PRINT:PRINT"PRESS RUN/STOP WHEN DONE
 "                                         LH
·250 GET A$:IF A$="" THEN 250              OE
·260 PRINT "[CLEAR]  -PRESS ANY KEY TO RE
 TURN TO MENU-"                            AJ
·270 ON VAL(A$)+1 GOTO 10,20,30,40,50,60,
 70,80,90,110                              EC
·280 GOTO 200                              EG
·290 GET A$:IF A$="" THEN RETURN           NK
·300 FOR I=0 TO 18:POKE 54272+I,0:NEXT     OA
·310 GOTO 200                              EG
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81-83 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

CRAZY JOE
FROM PAGE 61

```
·40 POKE53281,0:POKE53280,0                    ED
·50 C=0:FORZ=12288TO12415:READQ:POKEZ,Q:C=C
+Q:NEXTZ                                       EI
·60 IFC<>11890THENPRINT"ERROR IN DATA --> L
INES 590-740":END                              KK
·70 C=0:FORA=828TO907:READD:POKEA,D:C=C+D:N
EXT                                            GE
·80 IFC<>9217THENPRINT"ERROR IN DATA --> LI
NES 760-890":END                               PN
·90 PRINT"[CLEAR][BLUE][40"[s *]"]"            IC
·100 PRINT"[UP][RVSON][CYAN][15" "]CRAZY JO
E[16" "]"                                      LH
·110 PRINT"[UP][BLUE][40"[s *]"]"              GI
·120 PRINTSPC(13)"[WHITE][5"[DOWN]"](F1) EA
SY"                                            KB
·130 PRINTSPC(13)"[DOWN](F3) NORMAL"           OB
·140 PRINTSPC(13)"[DOWN](F5) DIFFICULT"        LB
·150 PRINTSPC(13)"[DOWN][RVSON]FIRE[RVSOFF]
 PREVIOUS CHOICE"                              LL
·160 AD=56320:V=53248:POKEV+30,0:C1=0:SC%=0
:F=.02                                         IE
·170 SYS828                                    EF
·180 POKE2040,192:FORD=1TO6:D(D)=0:POKED+20
40,193:NEXTD                                   KC
·190 X=INT((RND(1)*85)+20)*2                   OA
·200 POKEV+1,180                               JO
·210 POKEV+29,126:POKEV+23,126:POKEV+39,1:P
OKEV+28,1:POKEV+37,0:POKEV+38,6                PK
·220 FORBB=1TO6:POKEV+BB*2,0:B(BB)=-19+(BB*
39.9):NEXT                                     AO
·230 BB=INT(RND(1)*6+1):AB=INT(RND(1)*6+1)*
2:IFB(BB)=0ORPEEK(V+AB)<>0THEN230              BO
·240 POKEV+AB,B(BB):B(BB)=0:C1=C1+1:IFC1=6T
HEN270                                         NK
·250 POKE54296,15:POKE54277,8:POKE54278,248 AK
·260 POKE54273,100:POKE54272,100:POKE54276,
23:FORLL=1TO40:NEXT:POKE54276,16:GOTO230       IP
·270 GETK$:IFK$="[F1]"THENC$="EASY":R=1.5:G
OTO320                                         DI
·280 IFK$="[F5]"THENC$="DIFFICULT":R=5:GOTO
320                                            OL
·290 IFE=1AND(PEEK(AD)AND16)=0THENR=RR:GOTO
325                                            PE
·300 IFK$<>"[F3]"THEN270                       FF
·310 R=3:C$="NORMAL"                           KC
·320 RR=R                                      KN
·325 POKEV,X:POKEV+21,127:E=1                  OJ
·330 PRINT"[CLEAR]":FORZ=.TO23:PRINT"[RVSON
][c 4][s G][3" "][s H][s G][3" "][s H][s G
][3" "][s H][s G][3" "][s H][s G][3" "][s
H][s G][3" "][s H]":NEXTZ                      HA
·340 PRINT"[RVSON][s G][3" "][s H][s G][3"
"][s H][s G][3" "][s H][s G][3" "][s H][s
G][3" "][s H][s G][3" "][s H]";                HI
·350 PRINT"[HOME][BLUE]"SPC(31)"SC:":PRINTS
PC(31)"[DOWN][c 7]HI:"HS%                      LN
·360 PRINTSPC(31)"[DOWN][CYAN]LEVEL:"          IE
·370 PRINTSPC(31)C$"[BLUE]                     HF
·380 SC%=SC%+1:PRINT"[HOME]"SPC(34)SC%:GETK
$:IFK$=" "THENPOKEV+21,0:GOTO90                GF
·390 R=R+F:IFPEEK(V)=20ORPEEK(V)=244THENA$=
"YOU RAN OFF THE ROAD!":GOTO440                JO
·400 FORM=1TO6:D(M)=D(M)+M*R:IFD(M)=>255THE
ND(M)=0:POKEV+39+M,INT(RND(1)*10)              EN
·410 POKEV+(M*2)+1,D(M):NEXT                   ME
·420 IF(PEEK(V+30)AND1)ANDSC%>3THENA$=" YOU
 RAN INTO A CAR! ":GOTO440                     GI
·430 GOTO380                                   CH
·440 IFSC%>HS%THENHS%=SC%:FORL=54272TOL+23:
POKEL,0:NEXT                                   LC
·450 POKE56334,PEEK(56334)AND254:POKE2040,1
3                                              EO
·470 POKE54277,27:POKE54278,5:POKE54276,129
:POKE54273,4:FORQQ=1TO110:NEXT                 OE
·480 POKE54273,5:POKE54272,1:POKE54296,15      JJ
·490 FORQQ=1TO255:POKEV+39,QQ:NEXT             EA
·500 PRINT"[CLEAR][RVSON][WHITE][10" "]"A$"
[9" "]"                                        CO
·510 PRINT"[DOWN]SCORE"SC%TAB(26)"HIGH SCOR
E"HS%                                          HI
·520 POKEV+21,0:POKE56334,PEEK(56334)OR1       BD
·530 PRINTSPC(7)"[3"[DOWN]"][WHITE][RVSOFF]
 PRESS [RVSON]FIRE[RVSOFF] TO PLAY AGAIN"      FE
·540 PRINTSPC(10)"[DOWN][DOWN]PUSH FORWARD
 TO QUIT"                                      OI
·550 IFNOTPEEK(AD)AND16THEN90                  AJ
·560 IF(PEEK(AD)AND15)=14THENEND               OO
·570 GOTO550                                   CK
·580 REM*SPRITE DATA*                          BJ
·590 DATA0,20,0,0,20,0,0,20                    LI
·600 DATA0,0,150,0,0,215,0,0                   GC
·610 DATA215,0,0,215,0,0,195,0                 KK
·620 DATA0,252,0,2,170,128,8,60                LG
·630 DATA32,8,60,32,8,40,32,0                  KM
·640 DATA235,0,0,235,0,1,235,64                NN
·650 DATA0,235,0,0,235,0,0,255                 AB
·660 DATA0,0,20,0,0,20,0,0                     MP
·670 DATA3,255,192,6,255,96,15,255             DB
·680 DATA240,15,255,240,15,255,240,14          OM
·690 DATA0,112,6,255,96,7,126,224              FI
·700 DATA7,0,224,7,255,224,7,255               CB
·710 DATA224,7,255,224,7,255,224,7             BM
·720 DATA255,224,15,0,240,15,126,240           EP
·730 DATA15,0,240,15,255,240,7,255             BK
·740 DATA224,3,255,192,1,0,128,169             EI
·750 REM*ML DATA*                              NF
·760 DATA120,169,73,141,20,3                   BA
```

```
·770 DATA169,3,141,21,3,88           BG
·780 DATA96,174,0,208,173,0          CA
·790 DATA220,41,15,201,7,240         EN
·800 DATA7,201,11,240,12,76          OA
·810 DATA107,3,224,244,240,11        MG
·820 DATA232,232,76,107,3,224        GF
·830 DATA20,240,2,202,202,142        JE
·840 DATA0,208,173,0,220,41          PE
·850 DATA16,172,1,208,201,16         PG
·860 DATA240,6,192,50,240,6          OH
·870 DATA136,136,192,230,240,1       FD
·880 DATA200,140,1,208,76,49         PO
·890 DATA234,0                       IG
```

HEAD-ON
FROM PAGE 68

Beginning Address in hex: C000
Ending Address in hex: CF5F
Sys to Start: 49152
***Flankspeed* required for entry! See page 83.**

```
C000: 4C 24 CF AD 4D 03 D0 54 63
C008: AE 4F 03 E8 8E 4F 03 E0 B3
C010: FF D0 05 A9 01 8D 4D 03 6E
C018: AD 4B 03 C9 08 F0 20 38 2F
C020: AD 43 03 E9 01 8D 43 03 D2
C028: AD 44 03 E9 00 8D 44 03 DB
C030: B0 0A A9 FF 8D 43 03 A9 12
C038: 03 8D 44 03 4C 5C C0 18 91
C040: AD 43 03 69 01 8D 43 03 72
C048: AD 44 03 69 00 8D 44 03 7B
C050: C9 04 90 08 A9 00 8D 43 31
C058: 03 8D 44 03 AD 4E 03 D0 FF
C060: 54 AE 50 03 E8 8E 50 03 81
C068: E0 FF D0 05 A9 01 8D 4E A5
C070: 03 AD 4C 03 C9 08 F0 20 53
C078: 38 AD 46 03 E9 01 8D 46 66
C080: 03 AD 47 03 E9 00 8D 47 3A
C088: 03 B0 0A A9 03 8D 47 03 CA
C090: A9 FF 8D 46 03 4C B5 C0 D3
C098: 18 AD 46 03 69 01 8D 46 E5
C0A0: 03 AD 47 03 69 00 8D 47 D9
C0A8: 03 C9 04 90 08 A9 00 8D 49
C0B0: 46 03 8D 47 03 60 AD 01 E0
C0B8: DC 29 1F 49 1F 8D 49 03 20
C0C0: AE 3F 03 29 01 F0 01 CA 98
C0C8: AD 49 03 29 02 F0 01 E8 C8
C0D0: E0 00 D0 01 E8 E0 4F 90 2D
C0D8: 02 A2 4E 8E 3F 03 AD 49 93
C0E0: 03 29 04 F0 1D 38 AD 3D 42
C0E8: 03 E9 01 8D 3D 03 AD 3E 90
C0F0: 03 E9 00 8D 3E 03 B0 0A 67
C0F8: A9 03 8D 3E 03 A9 FF 8D AB
C100: 3D 03 AD 49 03 29 08 F0 5C
C108: 1D 18 AD 3D 03 69 01 8D 23
C110: 3D 03 AD 3E 03 69 00 8D 36
C118: 3E 03 C9 04 90 08 A9 00 69
C120: 8D 3D 03 8D 3E 03 60 AD CA
C128: 00 DC 29 1F 49 1F 8D 4A 8D
C130: 03 AC 3C 03 C0 01 D0 03 B4
C138: 20 46 CC AE 42 03 29 01 89
C140: F0 01 CA AD 4A 03 29 02 23
C148: F0 01 E8 E0 00 D0 01 E8 BE
C150: E0 4F 90 02 A2 4E 8E 42 D4
C158: 03 AD 4A 03 29 04 F0 1D 91
C160: 38 AD 40 03 E9 01 8D 40 42
C168: 03 AD 41 03 E9 00 8D 41 16
C170: 03 B0 0A A9 03 8D 41 03 AC
C178: A9 FF 8D 40 03 AD 4A 03 ED
C180: 29 08 F0 1D 18 AD 40 03 C8
C188: 69 01 8D 40 03 AD 41 03 B5
C190: 69 00 8D 41 03 C9 04 90 2A
C198: 08 A9 00 8D 40 03 8D 41 E9
C1A0: 03 60 A9 00 20 19 C6 AD 5B
C1A8: 4D 03 D0 4E A0 00 AD 42 A8
C1B0: 03 CD 45 03 B0 0A 38 AD 6A
C1B8: 45 03 ED 42 03 4C C8 C1 0B
C1C0: 38 AD 42 03 ED 45 03 C8 EA
C1C8: C9 18 B0 2E A9 02 C0 01 F6
C1D0: F0 02 A9 01 8D 4A 03 A9 F2
C1D8: 02 AE 45 03 E0 10 90 06 59
C1E0: E0 30 90 06 A9 01 8D 4A 0B
C1E8: 03 EA AC 4A 03 AD 40 03 C1
C1F0: 2D 54 03 F0 05 A0 00 8C 98
C1F8: 4A 03 AD 40 03 85 FB AD 66
C200: 41 03 85 FC AD 3D 03 85 3A
C208: FD AD 3E 03 85 FE A5 FC 1C
C210: D0 1F A5 FB C9 AB B0 19 E0
C218: A5 FE C9 03 D0 13 A5 FD 11
C220: C9 54 90 0D 18 A5 FB 69 FE
C228: 00 85 FB A5 FC 69 04 85 3F
C230: FC A5 FE D0 15 A5 FD C9 25
C238: AB B0 0F A5 FC C9 03 D0 E3
C240: 09 A5 FB C9 54 90 03 20 BC
C248: 6B C5 20 3E C6 20 79 C5 FD
C250: 4C CB C5 A0 00 A5 FC C5 37
C258: FE 90 1C F0 02 B0 06 A5 53
C260: FB C5 FD 90 12 A0 01 38 9C
C268: A5 FB E5 FD 85 FD A5 FC 14
C270: E5 FE 85 FE 84 FF 60 38 F6
C278: A5 FD E5 FB 85 FD A5 FE 26
C280: E5 FC 85 FE 84 FF 60 A5 72
C288: FF F0 08 A9 AB 38 E5 FD F2
C290: 85 FD 60 18 A5 FD 69 AB 45
C298: 85 FD A9 00 69 00 85 FE B3
C2A0: 60 A2 00 8A 95 61 E8 E0 EE
C2A8: 08 D0 F9 AD 15 D0 29 F1 2A
C2B0: 85 6B AD 10 D0 29 F1 85 D0
C2B8: 6C A9 AB 85 61 18 AD 3F 66
C2C0: 03 69 32 85 62 AD 3D 03 35
C2C8: 85 FB AD 3E 03 85 FC AD 69
C2D0: 40 03 85 FD AD 41 03 85 0F
C2D8: FE 20 8D C3 A5 FE D0 26 E4
C2E0: A5 FD C9 AC B0 20 A5 6B DC
C2E8: 09 02 85 6B 20 87 C2 A5 F4
```

```
C2F0: FE F0 06 A5 6C 09 02 85 89
C2F8: 6C A5 FD 85 63 18 AD 42 F9
C300: 03 6D C2 C2 85 64 AD 43 D0
C308: 03 85 FD AD 44 03 85 FE 08
C310: 20 8D C3 A5 FE D0 26 A5 C2
C318: FD C9 AC B0 20 A5 6B 09 77
C320: 04 85 6B 20 87 C2 A5 FE 24
C328: F0 06 A5 6C 09 04 85 6C 30
C330: A5 FD 85 65 18 AD 45 03 CC
C338: 6D C2 C2 85 66 AD 46 03 0E
C340: 85 FD AD 47 03 85 FE 20 60
C348: 8D C3 A5 FE D0 26 A5 FD D8
C350: C9 AC B0 20 A5 6B 09 08 B9
C358: 85 6B 20 87 C2 A5 FE F0 49
C360: 06 A5 6C 09 08 85 6C A5 21
C368: FD 85 67 18 AD 48 03 6D D1
C370: C2 C2 85 68 A2 00 B5 61 9D
C378: 9D 00 D0 E8 E0 08 D0 F6 80
C380: A5 6C 8D 10 D0 A5 6B 8D 9F
C388: 15 D0 60 EA EA A5 FE D0 1A
C390: 1F A5 FD C9 AB B0 19 A5 38
C398: FC C9 03 D0 13 A5 FB C9 B1
C3A0: 54 90 0D 18 A5 FD 69 00 B7
C3A8: 85 FD A5 FE 69 04 85 FE C2
C3B0: A5 FC D0 09 A5 FB C9 AB 44
C3B8: B0 03 4C AD C4 20 53 C2 61
C3C0: 60 A2 00 8A 95 61 E8 E0 0F
C3C8: 08 D0 F9 AD 15 D0 29 1F 77
C3D0: 85 6B AD 10 D0 29 1F 85 1E
C3D8: 6C A9 AB 85 61 18 AD 42 89
C3E0: 03 69 9A 85 62 AD 40 03 C0
C3E8: 85 FB AD 41 03 85 FC AD 8C
C3F0: 3D 03 85 FD AD 3E 03 85 29
C3F8: FE 20 8D C3 A5 FE D0 26 05
C400: A5 FD C9 AC B0 20 A5 6B FB
C408: 09 20 85 6B 20 87 C2 A5 32
C410: FE F0 06 A5 6C 09 20 85 C6
C418: 6C A5 FD 85 63 18 AD 3F 16
C420: 03 6D E2 C3 85 64 AD 43 12
C428: 03 85 FD AD 44 03 85 FE 28
C430: 20 8D C3 A5 FE D0 26 A5 E2
C438: FD C9 AC B0 20 A5 6B 09 97
C440: 40 85 6B 20 87 C2 A5 FE 80
C448: F0 06 A5 6C 09 40 85 6C 8C
C450: A5 FD 85 65 18 AD 45 03 EC
C458: 6D E2 C3 85 66 AD 46 03 4F
C460: 85 FD AD 47 03 85 FE 20 80
C468: 8D C3 A5 FE D0 26 A5 FD F8
C470: C9 AC B0 20 A5 6B 09 80 52
C478: 85 6B 20 87 C2 A5 FE F0 69
C480: 06 A5 6C 09 80 85 6C A5 B9
C488: FD 85 67 18 AD 48 03 6D F1
C490: E2 C3 85 68 A2 00 B5 61 DE
C498: 9D 08 D0 E8 E0 08 D0 F6 A8
C4A0: A5 6C 8D 10 D0 A5 6B 8D BF
C4A8: 15 D0 60 EA EA A5 FE C9 33
C4B0: 03 D0 24 A5 FD C9 54 90 FA
C4B8: 1E 18 A5 FB 69 00 85 FB 7B
C4C0: A5 FC 69 04 85 FC 20 53 C6
C4C8: C2 38 A5 FB E9 00 85 FB D0
C4D0: A5 FC E9 04 85 FC 60 4C 90
C4D8: 53 C2 AD F8 63 C9 FC 90 50
C4E0: 08 49 01 8D F8 63 8D FD A8
C4E8: 63 AD F9 63 C9 FC 90 08 B6
C4F0: 49 01 8D F9 63 8D FC 63 14
C4F8: AD F8 63 C9 FB B0 08 49 CA
C500: 03 8D F8 63 8D FD 63 AD 89
C508: F9 63 C9 FB B0 08 49 03 30
C510: 8D F9 63 8D FC 63 AE F8 90
C518: 63 AD 49 03 29 08 F0 0E A5
C520: E0 FE B0 0A E8 E8 8E F8 14
C528: 63 8E FD 63 D0 13 AD 49 56
C530: 03 29 04 F0 0C E0 FE 90 CD
C538: 02 CA CA 8E F8 63 8E FD 47
C540: 63 AE F9 63 AD 4A 03 29 D3
C548: 04 F0 0C E0 FE 90 08 CA 8C
C550: CA 8E F9 63 8E FC 63 AD A3
C558: 4A 03 29 08 F0 0C E0 FE B3
C560: B0 08 E8 E8 8E F9 63 8E 65
C568: FC 63 60 18 A5 FD 69 00 4E
C570: 85 FD A5 FE 69 04 85 FE 8A
C578: 60 A5 FC C5 FE 90 0A F0 CB
C580: 02 B0 18 A5 FB C5 FD B0 61
C588: 12 38 A5 FD E5 FB 85 FD DB
C590: A5 FE E5 FC 85 FE A0 00 3D
C598: 4C A6 C5 38 A5 FB E5 FD 0F
C5A0: 85 FD A5 FC A0 01 A9 00 12
C5A8: C0 00 F0 09 AE F9 63 E0 50
C5B0: FE 90 02 A9 04 C0 01 F0 A2
C5B8: 09 AE F9 63 E0 FE B0 02 60
C5C0: A9 08 0D 4A 03 8D 4A 03 A7
C5C8: 60 EA EA AD 4E 03 F0 08 F6
C5D0: AD 4A 03 09 10 8D 4A 03 BF
C5D8: 60 A0 FB AE 29 D0 E8 8E F5
C5E0: 29 D0 8E 2A D0 8E 2D D0 F0
C5E8: 8E 2E D0 AD 4D 03 F0 02 67
C5F0: A0 F6 8C FA 63 8C FE 63 62
C5F8: A0 FB AD 4E 03 F0 02 A0 28
C600: F6 8C FB 63 8C FF 63 60 33
C608: 20 9F CD 29 01 8D 52 03 A2
C610: AD 56 03 29 10 8D 53 03 34
C618: 60 8D 4A 03 AD 4D 03 F0 42
C620: 1C A9 01 AE 3F 03 EC 42 07
C628: 03 90 02 A9 02 20 50 CF A9
C630: AD 40 03 2D 54 03 F0 05 9B
C638: A9 00 8D 4A 03 60 AE 51 1D
C640: 03 CA 8E 51 03 D0 06 A2 6A
C648: 02 8E 51 03 60 AC F9 63 97
C650: A9 04 C0 FE 90 02 A9 08 02
C658: 0D 4A 03 8D 4A 03 4C 41 1B
C660: CC A0 03 B1 FB 29 80 18 40
C668: F0 01 38 A9 00 69 00 85 2B
C670: 02 18 A5 FB 69 38 85 FD 51
C678: A5 FC 69 01 85 FE 18 A5 C7
C680: 02 F0 01 38 B1 FD 2A 91 18
C688: FD A9 00 69 00 85 02 38 59
```

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C690: A5 FD E9 08 85 FD A5 FE 4E
C698: E9 00 85 FE A5 FE C5 FC 6E
C6A0: 90 0A F0 02 B0 D8 A5 FD 5B
C6A8: C5 FB B0 D2 C8 C0 07 90 0F
C6B0: B2 60 A0 03 18 A5 FB 69 8A
C6B8: 38 85 FD A5 FC 69 01 85 07
C6C0: FE B1 FD 6A A9 00 69 00 EC
C6C8: 85 02 A5 FB 85 FD A5 FC 18
C6D0: 85 FE 18 A5 02 F0 01 38 3F
C6D8: B1 FD 6A 91 FD A9 00 69 95
C6E0: 00 85 02 18 A5 FD 69 08 95
C6E8: 85 FD A5 FE 69 00 85 FE FE
C6F0: 38 A5 FD E5 FB 85 FF A5 D9
C6F8: FE E5 FC F0 D5 A5 FF C9 11
C700: 39 90 CF C8 C0 07 D0 AC A7
C708: 60 AD 49 03 29 0C F0 12 9A
C710: A2 4D 86 FC A2 C0 86 FB 69
C718: C9 04 F0 03 4C 61 C6 4C 9A
C720: B2 C6 60 AD 4A 03 29 0C 2A
C728: F0 F8 A2 00 86 FB A2 5E 38
C730: 86 FC C9 04 F0 03 4C 61 23
C738: C6 4C B2 C6 A9 00 A8 85 9C
C740: FB A9 40 85 FC 98 91 FB CE
C748: C8 D0 FB A6 FC E8 86 FC ED
C750: E0 60 D0 F1 A0 00 B9 7F 2E
C758: C7 99 C0 4D 99 00 5E B9 79
C760: BF C7 99 00 4E 99 40 5E 08
C768: C8 D0 EB A9 50 A0 00 99 22
C770: 00 60 99 00 61 99 00 62 C7
C778: 99 E8 62 C8 D0 F1 60 00 49
C780: 00 00 00 00 00 00 FF 00 80
C788: 00 00 00 00 00 FF FF 00 88
C790: 00 00 00 00 FF FF FF 00 90
C798: 00 00 00 FF FF FF FF 00 98
C7A0: 00 00 FF FF FF FF FF 00 A0
C7A8: 00 00 00 FF FF FF FF 00 A8
C7B0: 00 00 00 00 FF FF FF 00 B0
C7B8: 00 00 00 00 00 FF FF 00 B8
C7C0: 00 00 00 00 00 00 FF 00 C0
C7C8: 00 00 00 00 00 FF FF 00 C8
C7D0: 00 00 00 00 FF FF FF 00 D0
C7D8: 00 00 00 FF FF FF FF 00 D8
C7E0: 00 00 FF FF FF FF FF 00 E0
C7E8: 00 00 00 FF FF FF FF 00 E8
C7F0: 00 00 00 00 FF FF FF 00 F0
C7F8: 00 00 00 00 00 FF FF 00 F8
C800: 00 00 00 00 00 00 FF 00 FF
C808: 00 00 00 00 00 FF FF 00 08
C810: 00 00 00 00 FF FF FF 00 10
C818: 00 00 00 FF FF FF FF 00 18
C820: 00 00 FF FF FF FF FF 00 20
C828: 00 00 00 FF FF FF FF 00 28
C830: 00 00 00 00 FF FF FF 00 30
C838: 00 00 00 00 00 FF FF 00 38
C840: 00 00 00 00 00 00 FF 00 40
C848: 00 00 00 00 00 FF FF 00 48
C850: 00 00 00 00 FF FF FF 00 50
C858: 00 00 00 FF FF FF FF 00 58
C860: 00 00 FF FF FF FF FF 00 60
C868: 00 00 00 FF FF FF FF 00 68
C870: 00 00 00 00 FF FF FF 00 70
C878: 00 00 00 00 00 FF FF 00 78
C880: 00 00 00 00 00 00 FF 00 80
C888: 00 00 00 00 00 FF FF 00 88
C890: 00 00 00 00 FF FF FF 00 90
C898: 00 00 00 FF FF FF FF 00 98
C8A0: 00 00 FF FF FF FF FF 00 A0
C8A8: 00 00 00 FF FF FF FF 00 A8
C8B0: 00 00 00 00 FF FF FF 00 B0
C8B8: 00 00 00 00 00 FF FF A2 5B
C8C0: 00 BD E2 C8 9D 40 7E BD 44
C8C8: E2 C9 9D 40 7F EA EA EA 93
C8D0: EA EA EA E8 D0 EB A2 00 D9
C8D8: 8A 9D 80 7D E8 E0 40 D0 D9
C8E0: F8 60 02 00 00 00 00 00 3C
C8E8: 11 20 00 00 00 00 04 80 9E
C8F0: 00 90 24 00 04 80 00 00 2A
C8F8: 00 00 12 20 00 00 00 00 2B
C900: 01 00 00 00 00 00 00 00 01
C908: 00 00 00 00 00 00 00 00 08
C910: 00 00 00 00 00 00 00 00 10
C918: 00 00 00 00 00 00 00 00 18
C920: 00 FF 00 00 00 22 10 00 52
C928: 00 00 00 09 40 00 00 00 71
C930: 00 4B 48 00 00 00 00 0A CD
C938: 40 00 00 00 00 21 10 00 A9
C940: 00 00 00 00 00 00 00 00 40
C948: 00 00 00 00 00 00 00 00 48
C950: 00 00 00 00 00 00 00 00 50
C958: 00 00 00 00 00 00 00 00 58
C960: 00 00 10 00 00 7C 00 00 EC
C968: 6C 00 00 D6 00 00 6C 00 18
C970: 00 7C 00 00 10 00 00 00 FC
C978: 00 00 00 00 00 00 00 00 78
C980: 00 00 00 00 00 00 00 00 80
C988: 00 00 00 00 00 00 00 00 88
C990: 00 00 00 00 00 00 00 00 90
C998: 00 00 00 00 00 00 00 00 98
C9A0: 00 00 00 3F 00 00 0C 00 EB
C9A8: 00 0C 00 01 FC 00 02 FF B4
C9B0: E0 04 FF F0 0F FF FF 7F 15
C9B8: FF F2 0F FF E2 00 80 80 9E
C9C0: 03 FF E0 00 00 00 00 00 A4
C9C8: 00 00 00 00 00 00 00 00 C8
C9D0: 00 00 00 00 00 00 00 00 D0
C9D8: 00 00 00 00 00 00 00 00 D8
C9E0: 00 00 1F CC FE 00 0C 00 D7
C9E8: 00 0C 00 01 FC 00 02 FF F4
C9F0: E2 04 FF F2 0F FF FF 7F 59
C9F8: FF F0 0F FF E0 00 80 80 DA
CA00: 03 FF E0 00 00 00 00 00 E3
CA08: 00 00 00 00 00 00 00 00 08
CA10: 00 00 00 00 00 00 00 00 10
CA18: 00 00 00 00 00 00 00 00 18
CA20: 00 00 00 FC 00 00 30 00 4D
CA28: 00 30 00 00 3F 80 07 FF 1F
```

```
CA30: 40 0F FF 20 FF FF F0 4F DF
CA38: FF FE 47 FF F0 01 01 00 71
CA40: 07 FF C0 00 00 00 00 00 08
CA48: 00 00 00 00 00 00 00 00 48
CA50: 00 00 00 00 00 00 00 00 50
CA58: 00 00 00 00 00 00 00 00 58
CA60: 00 00 7F 33 F8 00 30 00 3C
CA68: 00 30 00 00 3F 80 47 FF 9F
CA70: 40 4F FF 20 FF FF F0 0F 20
CA78: FF FE 07 FF F0 01 01 00 71
CA80: 07 FF C0 00 00 00 00 00 48
CA88: 00 00 00 00 00 00 00 00 88
CA90: 00 00 00 00 00 00 00 00 90
CA98: 00 00 00 00 00 00 00 00 98
CAA0: 00 00 93 05 08 0D 0D 48 A3
CAA8: 45 41 44 2D 4F 4E 0D 0D 58
CAB0: 42 59 20 4A 4F 48 4E 20 BC
CAB8: 46 45 44 4F 52 20 0D 0D 64
CAC0: 0D 4E 55 4D 42 45 52 20 B8
CAC8: 4F 46 20 50 4C 41 59 45 FA
CAD0: 52 53 20 28 31 2F 32 29 7A
CAD8: 3F 0D 0D 43 4F 4D 50 55 B7
CAE0: 54 45 52 20 44 49 46 46 07
CAE8: 49 43 55 4C 54 59 20 28 0D
CAF0: 12 45 92 41 53 59 2F 12 0A
CAF8: 48 92 41 52 44 29 3F 0D 21
CB00: 0D A2 00 8A 9D 3C 03 E8 FF
CB08: E0 20 D0 F8 8E 3F 03 8E 32
CB10: 42 03 A2 01 8E 55 03 8E 6E
CB18: 4D 03 8E 4E 03 E8 4C 48 C5
CB20: CF 00 00 38 AD 4D 03 F0 17
CB28: 48 AD 49 03 29 10 F0 41 D5
CB30: 20 4D CC C9 FE 90 3B 18 17
CB38: AD 3D 03 69 1A 85 FB AD D8
CB40: 3E 03 69 00 85 FC A9 08 1F
CB48: 8D 4B 03 A5 FC C9 04 D0 65
CB50: 0D 38 A5 FB E9 00 85 FB A2
CB58: A5 FC E9 04 85 FC A5 FB 0D
CB60: 8D 43 03 A5 FC 8D 44 03 AB
CB68: 18 AD 3F 03 69 05 8D 45 B1
CB70: 03 60 38 AD 3D 03 E9 0A ED
CB78: 85 FB AD 3E 03 E9 00 85 58
CB80: FC B0 0D 18 A5 FB 69 00 5E
CB88: 85 FB A5 FC 69 04 85 FC 9C
CB90: A9 04 8D 4B 03 A5 FB 8D 49
CB98: 43 03 A5 FC 8D 44 03 18 6E
CBA0: AD 3F 03 69 05 8D 45 03 D4
CBA8: 60 38 AD 4E 03 F0 48 AD 27
CBB0: 4A 03 29 10 F0 41 20 59 E2
CBB8: CC C9 FE 90 3B 18 AD 40 20
CBC0: 03 69 1A 85 FB AD 41 03 BA
CBC8: 69 00 85 FC A9 08 8D 4C 40
CBD0: 03 A5 FC C9 04 D0 0D 38 5A
CBD8: A5 FB E9 00 85 FB A5 FC 88
CBE0: E9 04 85 FC A5 FB 8D 46 C6
CBE8: 03 A5 FC 8D 47 03 18 AD 2C
CBF0: 42 03 69 05 8D 48 03 60 DD
CBF8: 38 AD 40 03 E9 0A 85 FB 97
```

```
CC00: AD 41 03 E9 00 85 FC B0 0F
CC08: 0D 18 A5 FB 69 00 85 FB B9
CC10: A5 FC 69 04 85 FC A9 04 50
CC18: 8D 4C 03 A5 FB 8D 46 03 6D
CC20: A5 FC 8D 47 03 18 AD 42 A2
CC28: 03 69 05 8D 48 03 60 A9 7C
CC30: 00 8D 4D 03 AD F8 63 60 78
CC38: A9 00 8D 4E 03 AD F9 63 CB
CC40: 60 68 68 4C CB C5 20 A2 12
CC48: C1 AD 4A 03 60 A2 81 8E 18
CC50: 04 D4 CA 8E 04 D4 4C 2F D6
CC58: CC A2 81 8E 0B D4 CA 8E 11
CC60: 0B D4 4C 38 CC A2 00 8A BE
CC68: 9D 00 D4 E8 E0 18 D0 F8 86
CC70: A9 0F 8D 18 D4 A9 F9 8D D4
CC78: 06 D4 8D 0D D4 A9 18 8D 12
CC80: 01 D4 8D 08 D4 A9 02 8D F9
CC88: 14 D4 A9 19 8D 0F D4 60 06
CC90: AE 55 03 CA 8E 55 03 D0 1A
CC98: 0E A2 81 8E 12 D4 CA 8E 99
CCA0: 12 D4 A2 05 8E 55 03 60 76
CCA8: 20 90 CC 20 D9 C5 20 DA E0
CCB0: C4 20 23 CB 20 A9 CB 20 3A
CCB8: 03 C0 20 03 C0 20 03 C0 44
CCC0: 20 B6 C0 20 27 C1 20 A1 23
CCC8: C2 20 C1 C3 20 15 CD 20 54
CCD0: 2A CD 20 08 C6 AD 52 03 BA
CCD8: D0 05 AD 53 03 F0 C9 60 CD
CCE0: 20 3C C7 A9 FF A2 00 9D EE
CCE8: 00 4F 9D 40 4F E8 D0 F7 17
CCF0: 60 20 08 C6 AD 52 03 D0 14
CCF8: F8 AD 53 03 D0 F3 60 20 3B
CD00: E0 CC 20 BF C8 20 65 CC A8
CD08: 20 A1 C2 20 C1 C3 20 F1 44
CD10: CC 20 A8 CC 60 AD 49 03 CC
CD18: 29 0C F0 03 4C 09 C7 A2 01
CD20: 08 A0 00 88 D0 FD CA D0 BB
CD28: FA 60 AD 4A 03 29 0C F0 A4
CD30: 03 4C 23 C7 A2 08 A0 00 B5
CD38: 88 D0 FD CA D0 FA 60 20 A6
CD40: A6 CD AD 52 03 F0 08 A2 53
CD48: FA 8E F8 63 8E FD 63 AD CB
CD50: 53 03 F0 08 A2 FA 8E F9 C5
CD58: 63 8E FC 63 A2 81 8E 04 61
CD60: D4 8E 0B D4 CA 8E 04 D4 D5
CD68: 8E 0B D4 20 DA C4 A2 34 6D
CD70: A0 00 88 D0 FD CA D0 FA FE
CD78: 20 DA C4 A2 81 8E 04 D4 C3
CD80: 8E 0B D4 A2 0F 8E 18 D4 1C
CD88: 86 02 A2 50 A0 00 88 D0 FD
CD90: FD CA D0 FA 20 DA C4 A6 8B
CD98: 02 CA E0 FF D0 E7 60 AD 0D
CDA0: 1E D0 8D 56 03 60 20 FF F6
CDA8: CC A9 00 8D 49 03 8D 4A D0
CDB0: 03 60 A2 65 A0 00 88 D0 16
CDB8: FD CA D0 FA 60 20 3F CD DA
CDC0: A0 00 A9 00 85 FB A9 40 76
CDC8: 85 FC A9 FF 91 FB 18 A5 40
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81-83 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
CDD0: FB 69 08 85 FB A5 FC 69 CB
CDD8: 00 85 FC C9 5F D0 EB A5 E6
CDE0: FB C9 40 90 E5 84 02 20 04
CDE8: B2 CD A4 02 C8 C0 08 D0 72
CDF0: D1 A9 00 8D 15 D0 A0 00 80
CDF8: A9 5C 99 00 60 99 00 61 F3
CE00: 99 00 62 99 E8 62 C8 D0 7A
CE08: F1 A0 07 A9 00 85 FB A9 76
CE10: 40 85 FC A9 00 91 FB 18 22
CE18: A5 FB 69 08 85 FB A5 FC 4F
CE20: 69 00 85 FC C9 5F 90 EB B1
CE28: A5 FB C9 40 90 E5 88 84 57
CE30: 02 20 B2 CD A4 02 C0 FF 3A
CE38: D0 D1 60 A9 80 8D 18 D0 DB
CE40: A9 3B 8D 11 D0 A9 FF 8D CB
CE48: 1B D0 8D F8 63 8D F9 63 09
CE50: 8D FC 63 8D FD 63 A9 FB D2
CE58: 8D FA 63 8D FB 63 8D FE BD
CE60: 63 8D FF 63 AD 02 DD 09 4B
CE68: 03 8D 02 DD AD 00 DD 29 8D
CE70: FC 09 02 8D 00 DD 60 A9 ED
CE78: 15 8D 18 D0 A9 1B 8D 11 67
CE80: D0 AD 02 DD 09 03 8D 02 7A
CE88: DD AD 00 DD 29 FC 09 03 24
CE90: 8D 00 DD A9 00 8D 15 D0 19
CE98: 60 A2 00 BD A2 CA 20 D2 B9
CEA0: FF E8 E0 37 D0 F5 A9 00 12
CEA8: 85 C6 20 E4 FF C9 31 90 85
CEB0: F9 C9 33 B0 F5 38 E9 30 A0
CEB8: 8D 3C 03 C9 01 D0 24 A2 E7
CEC0: 00 BD D9 CA 20 D2 FF E8 FE
CEC8: E0 28 D0 F5 A9 00 85 C6 8E
CED0: 8D 54 03 20 E4 FF C9 48 CC
CED8: F0 09 C9 45 D0 F5 A9 01 53
CEE0: 8D 54 03 60 8E 3E 03 A2 98
CEE8: 80 8E 3D 03 60 A9 01 8D D0
CEF0: 27 D0 8D 2C D0 A9 0F 8D B9
CEF8: 28 D0 8D 2B D0 8D 2D D0 07
CF00: 8D 2E D0 8D 29 D0 8D 2A CB
CF08: D0 A9 0C 8D 21 D0 A9 05 BC
CF10: 8D 20 D0 A9 00 8D 1C D0 B2
CF18: 8D 1C D0 8D 17 D0 A9 11 C2
CF20: 8D 15 D0 60 A9 0C 8D 21 58
CF28: D0 A9 0E 8D 20 D0 20 77 C6
CF30: CE 20 01 CB 20 99 CE 20 94
CF38: ED CE 20 3B CE 20 BD CD CA
CF40: A9 93 20 D2 FF 4C 24 CF B0
CF48: A9 FF 8D 51 03 4C E4 CE D3
CF50: AE 3F 03 EC 42 03 D0 02 46
CF58: A9 00 8D 4A 03 60 00 00 3D
```

REVERSED REMARKS

FROM PAGE 72

MAIN PROGRAM

```
·100 FORI=50500TO50625:READQ:POKEI,Q:CK=C
 K+Q:NEXTI                                  CJ
·110 IFCK<>17850THENPRINT"[CLEAR][DOWN]ER
 ROR IN DATA STATEMENTS":END                AB
·120 PRINT"[CLEAR][DOWN][RVSON]SYS 50500
 [RVSOFF] TO PRINT REM LINES REVERSED"      BC
·130 PRINT"[DOWN][RVSON]SYS 50505 [RVSOFF
 ] TO PRINT REM LINES NORMALLY":NEW         FK
·140 DATA169,18,76,75,197,169,32,133,2,16
 5,43,133,251,165,44,133,252                JB
·150 DATA160,0,177,251,133,253,200,177,25
 1,133,254,160,3,200,177,251,201            MI
·160 DATA0,240,39,201,143,208,245,200,177
 ,251,201,0,240,28,201,32,240               HB
·170 DATA4,201,18,208,20,200,177,251,201,
 0,240,13,201,32,240,245,201                OO
·180 DATA18,240,241,136,165,2,145,251,165
 ,254,201,0,240,9,133,252,165               GO
·190 DATA253,133,251,76,85,197,162,0,189,
 188,197,240,7,32,210,255,232               IC
·200 DATA76,161,197,169,19,141,119,2,169,
 13,141,120,2,169,2,133,198                 DL
·210 DATA96,147,76,73,83,84,0               MO
```

TEST PROGRAM

```
·100 PRINT"[CLEAR][DOWN]TEST PROGRAM":REM
  MIDLINE TEST                              BO
·110 REMPRINT"LINE 110 PRINTING"            BD
·120 REM PRINT"LINE 120 PRINTING"           CI
·130 REM  PRINT"LINE 130 PRINTING"          PB
·140 REM        *** THIS IS LINE 140 ***    CF
·150 REM                                    JD
·160 REM                                    JD
·170 PRINT"[DOWN]WORKING":REMNO SPACE HER
 E                                          DF
·180 REM  NEXT TO LAST LINE                 PA
·190 PRINT"[DOWN]PROGRAM FINISHED":REM TH
 IS IS THE END OF THE PROGRAM"              BE
```

SCUTTLEBUTT

Continued from page 14

Broderbund's *Graphics Library* disks, are available from Master Software. Each 50-image collection costs $11.00, including postage to US and Canadian destinations (foreign orders add $5.00).

Master Software, 301-922-2962 (see address list, this page).

STREET SMARTS

Previously available for Apple, the *Bank Street Speller* ($49.95) allows users of the *Bank Street Writer* word processor for the C-64 to find and highlight typographical errors in their documents. The program suggests correct spellings for all apparent errors.

Broderbund Software, 415-479-1700 (see address list, this page).

AMIGA WORD PROCESSOR

In addition to the three Amiga utilities announced in last month's *Scuttlebutt,* Brown-Wagh Publishing will market the *Scribble!* word processor for the Amiga. The program is expected to be on sale by the time you read this. Price is $99.95.

Brown-Wagh Publishing, 408-395-3838 (see address list, this page).

MUSIC DEVELOPMENT

The Music System, a music development package from Firebird, has been released in both standard and advanced versions for the C-64.

The standard version ($39.95) allows full sonic tailoring of the SID chip, multivoicing, mono- or polyphonic modes, full editing and recording, and storage and playback of sound settings and compositions.

The advanced version ($79.95) adds MIDI capabilities (when used with either S.I.E.L. or Passport Designs MIDI interfaces) and the ability to link and edit sequences, control six MIDI tracks or devices simultaneously, perform automatic transpositions or tempo conforming/correcting to MIDI drum machines, and print sheet music on a line printer. An upgrade from the standard to the advanced version is available at nominal cost.

Firebird, 201-934-7373 (see address list, this page).

6502 TOME

6502 Assembly Language Programming, Second Edition ($19.95) explains all 6502 and 65C02 instructions for serious programmers. 650 pages of flow charts, source programs, object code, and explanatory text help illustrate a variety of techniques from simple memory loops to complete design projects. Also covered are 6502 assembler conventions, the 6502 interrupt system, and interfacing methods for input/output devices.

Osborne/McGraw-Hill, 415-548-2805 (see address list, this page).

COMPANIES MENTIONED IN SCUTTLEBUTT

AC3L Software
P.O. Box 7
New Derry, PA 15671

Activision, Inc.
2350 Bayshore Frontage Road
Mountain View, CA 94043
Phone: 415-960-0410

Batteries Included
30 Mural Street
Richmond Hill, Ontario
L4B 1B5 Canada
Phone: 416-881-9941

Broderbund Software, Inc.
17 Paul Drive
San Rafael, CA 94903-2101
Phone: 415-479-1170

Brown-Wagh Publishing
1242 South Highland Avenue
Los Angeles, CA 90019
Phone: 213-936-5729

Cardco, Inc.
300 S. Topeka
Wichita, KS 67202
Phone: 316-267-6525

CSM Software, Inc.
P.O. Box 563
Crown Point, IN 46307
Phone: 219-663-4335

Commodore-Amiga, Inc.
Commodore International
1200 Wilson Drive
West Chester, PA 19380
Phone: 215-431-9100

Covox Inc.
675-D Conger Street
Eugene, OR 97402
Phone: 503-342-1271

Educational Activities, Inc.
1937 Grand Avenue
Baldwin, NY 11510
Phone: 516-223-4666

Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404
Phone: 415-571-7171

Emerald Component Int'l
P.O. Box 1441
Eugene, OR 97440
Phone: 1-800-356-5178 or 503-683-1154

Enhance Development Co.
P.O. Box 1294
Ballwin, MO 63022
Phone: 1-800-231-4545 or 314-423-8525

Freelance Communications
P.O. Box 717
Arcata, CA 95521
Phone: 707-826-0102

Firebird
P.O. Box 49
Ramsey, NJ 07446
Phone: 201-934-7373

Gamco Industries, Inc.
P.O. Box 1911
Big Spring, TX 79721
Phone: 1-800-351-1404; in TX call collect 915-267-6327

Gerhardt Software
32600 Concord Drive
Madison Heights, MI 48071

Howard W. Sams & Co.
4300 W. 62nd Street
Indianapolis, IN 46268
Phone: 317-298-5400

IntelliCreations, Inc.
19808 Nordhoff Place
Chatsworth, CA 91311
Phone: 818-886-5922

KAB Software
P.O. Box 429
Sykesville, MD 21784

MasterSoft
P.O. Box 1027
Bend, OR 97709
Phone: 503-388-7654

Master Software
6 Hillery Court
Randallstown, MD 21133
Phone: 301-922-2962

Music Service Software
801 Wheeler Rd.
Madison, WI 53704

Osborne/McGraw-Hill
2600 Tenth Street
Berkeley, CA 94710
Phone: 415-548-2805

Panamax
150 Mitchell Blvd.
San Rafael, CA 94903
Phone: 1-800-472-5555; in CA 1-800-472-6262

PlayNET, Inc.
200 Jordan Road
Troy, NY 12180
Phone: 1-800-PLAYNET or 518-8682

Simon & Schuster Electronic Publishing Division
Gulf+Western Building
One Gulf+Western Plaza
New York, NY 10023
Phone: 212-333-3397

Slipped Disk Inc.
31044 John R
Madison Heights, MI 48071
Phone: 313-583-9803

The Source
1616 Anderson Road
McLean, VA 22192
Phone: 800-336-3366

Spectrum 1 Network
9161 Beachy Avenue
Arleta, CA 91331
Phone: 213-897-2060

Value-Soft Inc.
9513 S.W. Barbur Blvd. #56
Portland, OR 97219
Phone: 503-246-0924

Please contact these manufacturers directly for further information on products and services listed.

...COMING IN THE AUGUST ISSUE OF *AHOY!* (ON SALE JULY 8)...

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